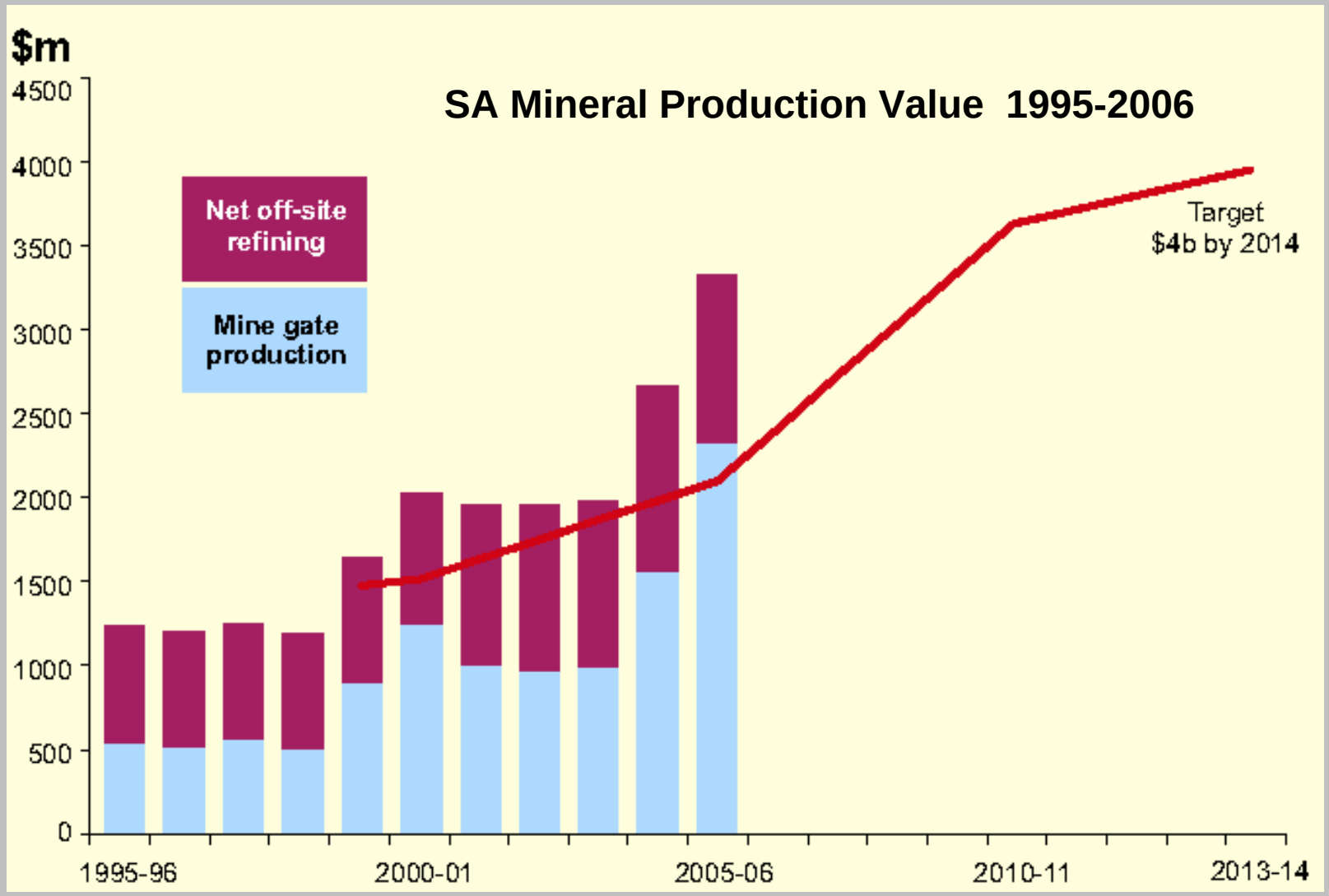
South Australia's Mining Boom

Is history being repeated?

Greg Drew

Senior Geologist
Mineral Resources Group
Primary Industries and Resources SA


$m
SA Mineral Production Value 1995-2006
4500
4000
3500
3000
2500
2000
1500
1000
500
0
Net off-site refining
Mine gate production
Target
$4b by 2014
1995-96
2000-01
2005-06
2010-11
2013-14

The Advertiser, 27 July, 2006

Mining leads export boom

NIGEL AUSTIN
RURAL EDITOR

SOUTH Australia's exports have risen strongly after three years in the doldrums as the mining boom kicks in.

That helped push up total exports by 15 per cent to $8.7 billion in 2005-06, second only to the record $9.1 billion in 2001-02.

Minerals became the state's largest individual export item for the first time since the mid-1800s.

There was a $400 million surge in shipments.

The rise in mineral exports to about $1.65 billion mostly was because of the increasing value of shipments from BHP's Olympic Dam mine at Roxby Downs. That produced about 12 per cent of the total value of the state's exports.

The mining boom pushed the state's wine exports into second place, following three years at the top. Wine shipments were stagnant at $1.5 billion.

The latest Australian Bureau of Statistics data shows, while the agricultural sector remained the largest broad export sector by a long way, the result was mixed across rural commodities.

The state's export growth also was helped by a $400 million rise in car shipments, mostly through GM Holden's strong export program across a range of vehicles and markets.

SA Chamber of Mines and Energy chief executive Phil Sutherland said the export growth was very positive.

"There are a number of mining projects at feasibility and if they come to fruition our export potential will increase markedly," Mr Sutherland said.

"This is an opportunity that cannot be lost and we have to maximise the potential of the resources industry for the good of the people of SA."

PAGE 36: Fuel price drives fear of downturn

GOING OVERSEAS

	2004-05	2005-06
Meat	$425m	$420m
Wheat	$397m	$465m
Wine	$1.57bn	$1.5bn
Wool	$173m	$160m
Machinery	$337m	$360m
Minerals	$1.24bn	$1.65bn
Seafood	$302m	$318m
Cars	$911m	$1.35bn
Petroleum	$232m	$280m
Other	$2.1bn	$2.3bn
Total	$7.6bn	$8.8bn

Source: ABS projections of South Australian commodity exports based on first 11 months of the financial year.

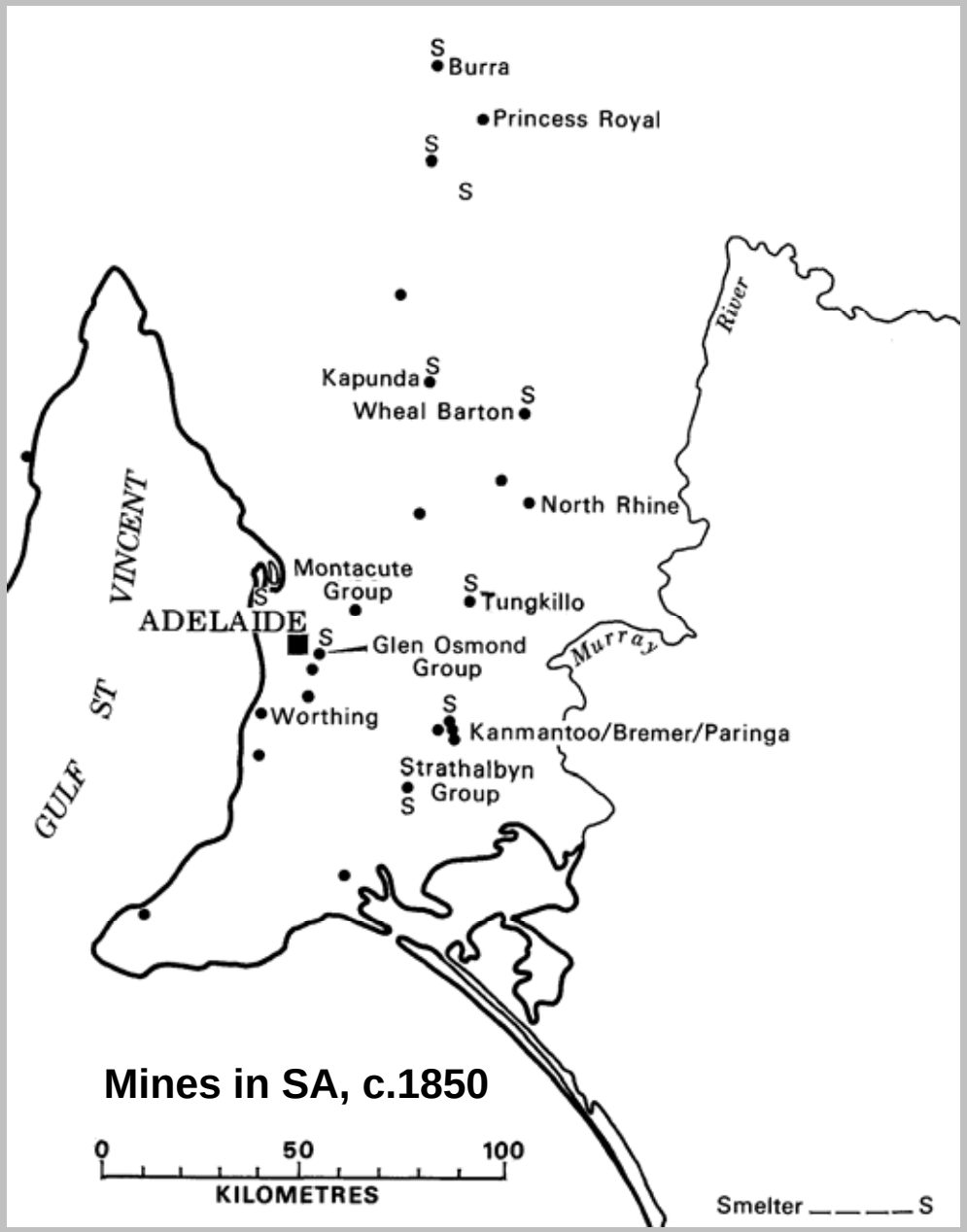
Minerals became the state's largest individual export item for the first time since the mid-1800s.

	1851	1861	2006
Minerals	58%	29%	19%
Wheat	14%	45%	5%
Wool	28%	26%	2%
Wine			17%
Cars			15%

Value of SA Exports

South Australia 1841-1851

- Possessed virtually all of Australia's metal mines
- the first metal mine in Australia – Wheal Gawler, 1841
- first commercial mine – Kapunda, 1844
- the first mining town – Burra, 1845
- Kapunda and Burra mines caused the first major decentralisation away from Adelaide
- population grew from 15,000 to 64,000 by 1850
- by 1850, SA produced about 10% of world copper and was known as the *Copper Kingdom*
- in 1850, minerals constituted 67% of the value of SA exports



Impacts of SA's First Mining Boom

Major impacts

- Immigration of a skilled mining workforce – Cornish and German miners
- Land survey
- Settlement patterns and housing
- Transport networks – road and rail

Minor impacts

- Energy – supplied by wood, horses, bullocks
- Water – self sufficient
- Communications - post

The Cornish Diaspora

(diaspora = dispersion of an ethnic group)

FREE
EMIGRATION TO PORT ADELAIDE,
SOUTH AUSTRALIA

Married Agricultural Laborers, Shepherds, Blacksmiths, Wheelwrights, Sawyers, Tailors, Shoe-makers, Brick-makers, Builders, and *all persons engaged in useful occupations* may obtain a

FREE PASSAGE

to SOUTH AUSTRALIA, where they are within the regulations of the Colonial Commissioners.

A meeting will be held by Mr. LATIMER, for the purpose of seeing the applicants and deciding on their eligibility

On TUESDAY, October 15, at BODMIN, at Ten o'clock.

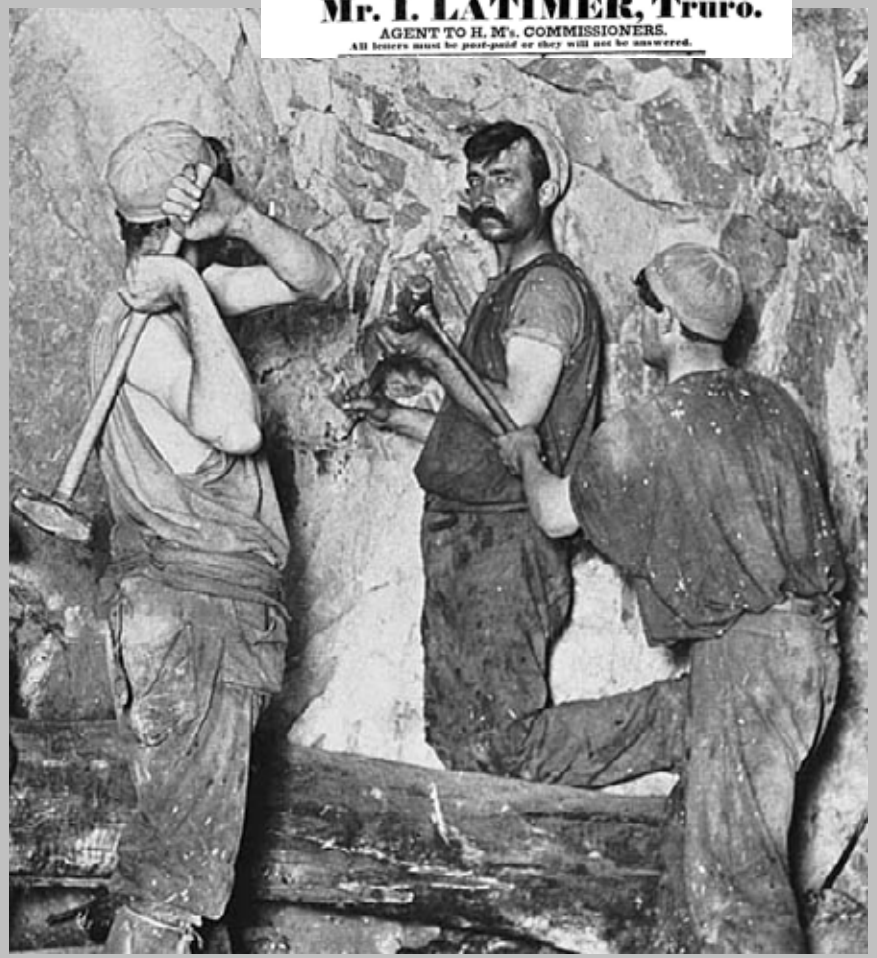
To the succeeding all particulars may be known on application to

Mr. I. LATIMER, Truro.

AGENT TO H. M's. COMMISSIONERS.

All letters must be post-paid or they will not be answered.

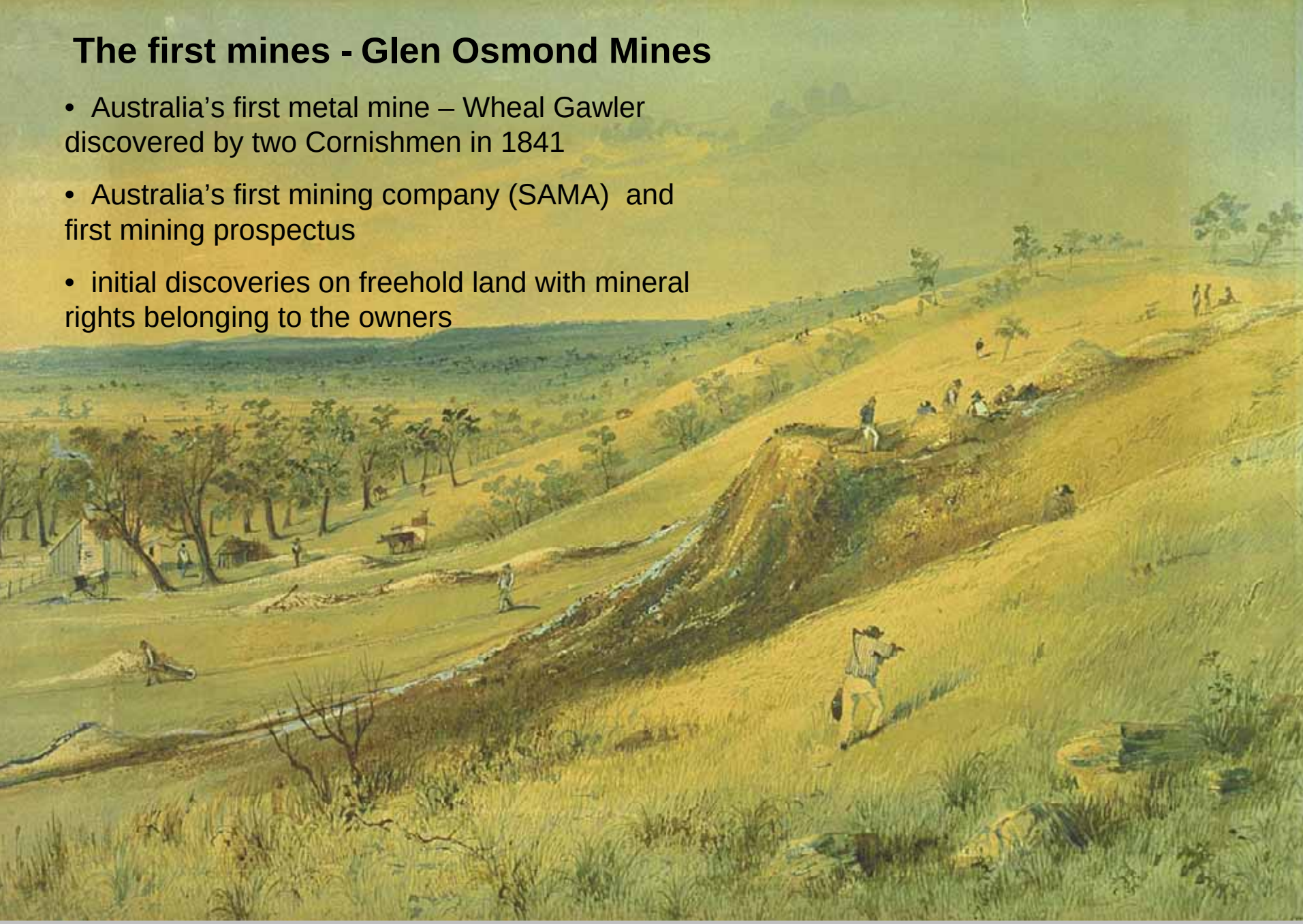
- the Cornish played a major role in SA's first mining boom
- the Cornish *diaspora* began in the mid 1850s and particularly after 1860 with the decline in its mining industry. This coincided with our first mining boom
- during the State's first 50 years about 10% of all immigrants were Cornish
- greatest influx in the mid-1860s coinciding with development of Moonta-Wallaroo mines
- Cornish miners brought with them their mining technology which was applied almost without change



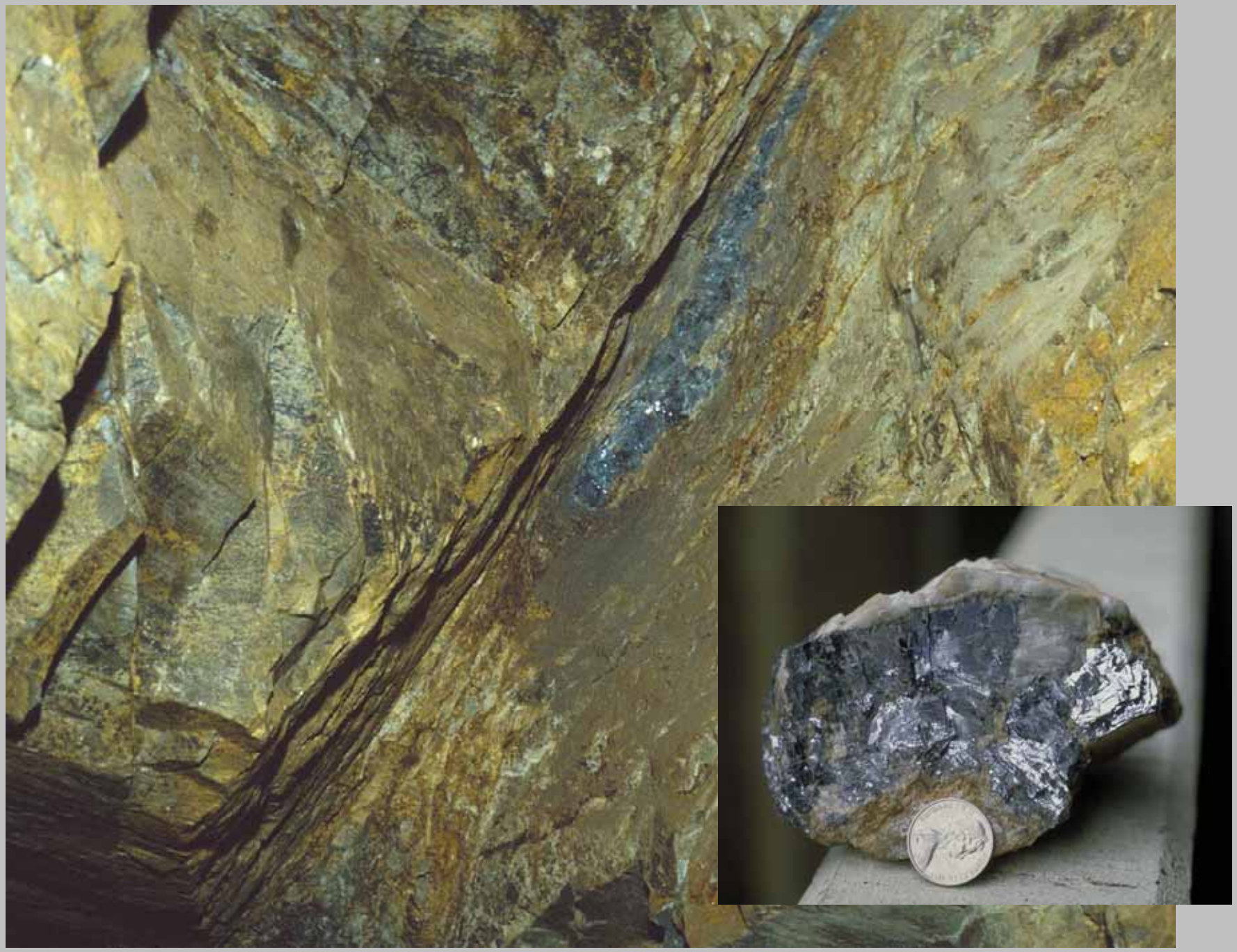
Cornish miners stoping by hand labour, Wallaroo Mine, c.1910

The first mines - Glen Osmond Mines

- Australia's first metal mine – Wheal Gawler discovered by two Cornishmen in 1841
- Australia's first mining company (SAMA) and first mining prospectus
- initial discoveries on freehold land with mineral rights belonging to the owners

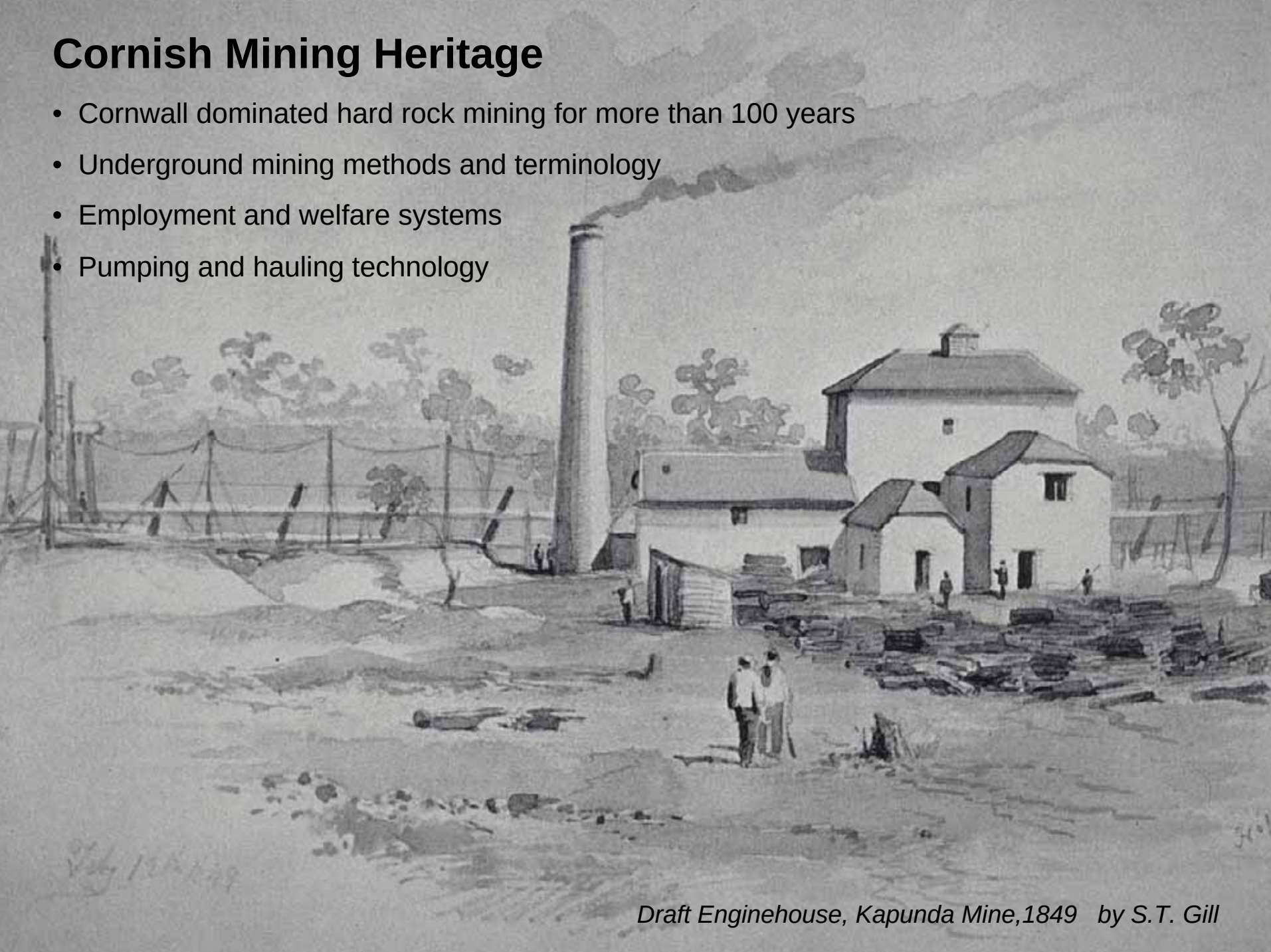


Glen Osmond Mine, 1845 by S.T. Gill



Cornish Mining Heritage

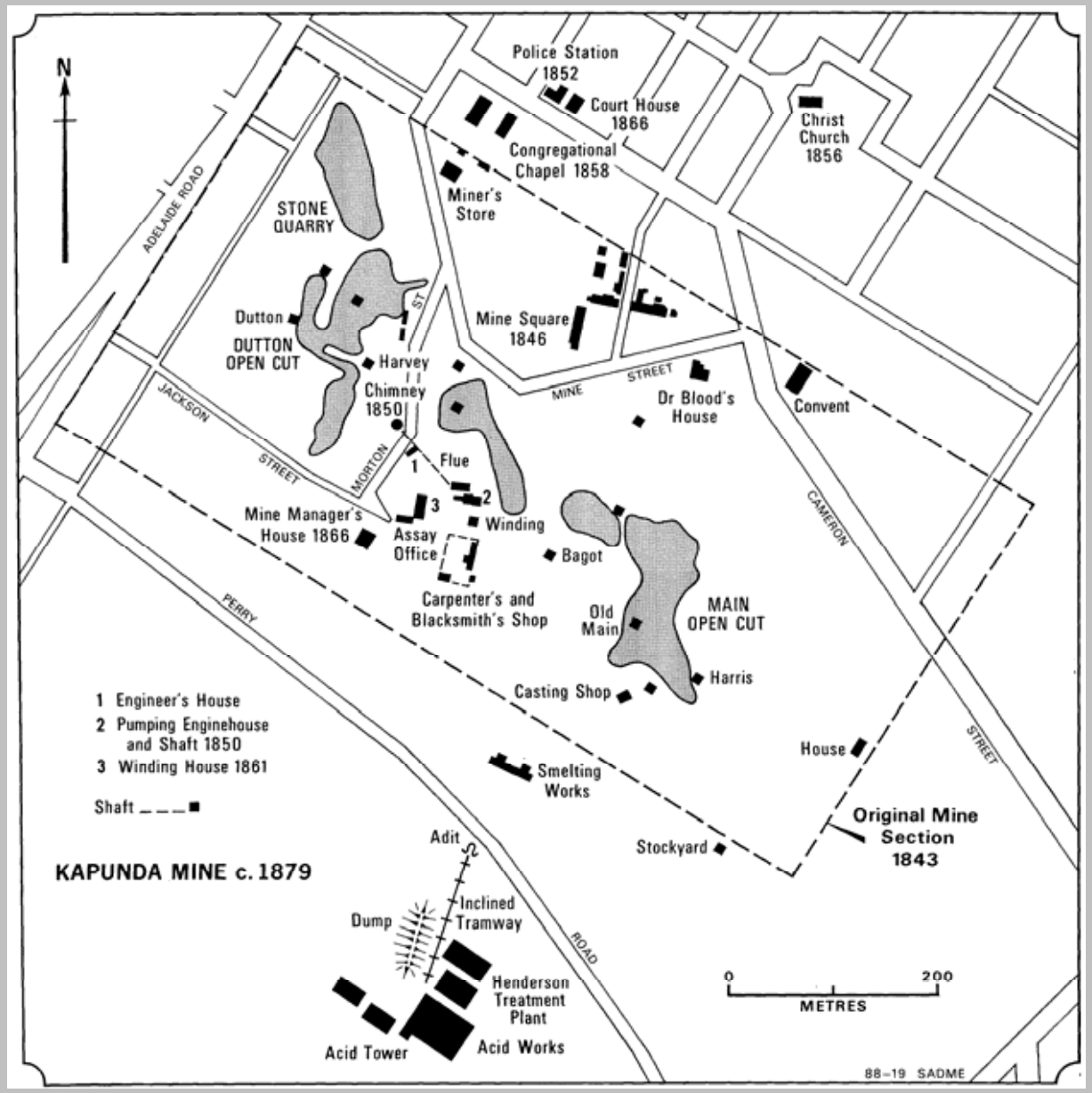
- Cornwall dominated hard rock mining for more than 100 years
- Underground mining methods and terminology
- Employment and welfare systems
- Pumping and hauling technology



Draft Enginehouse, Kapunda Mine,1849 by S.T. Gill

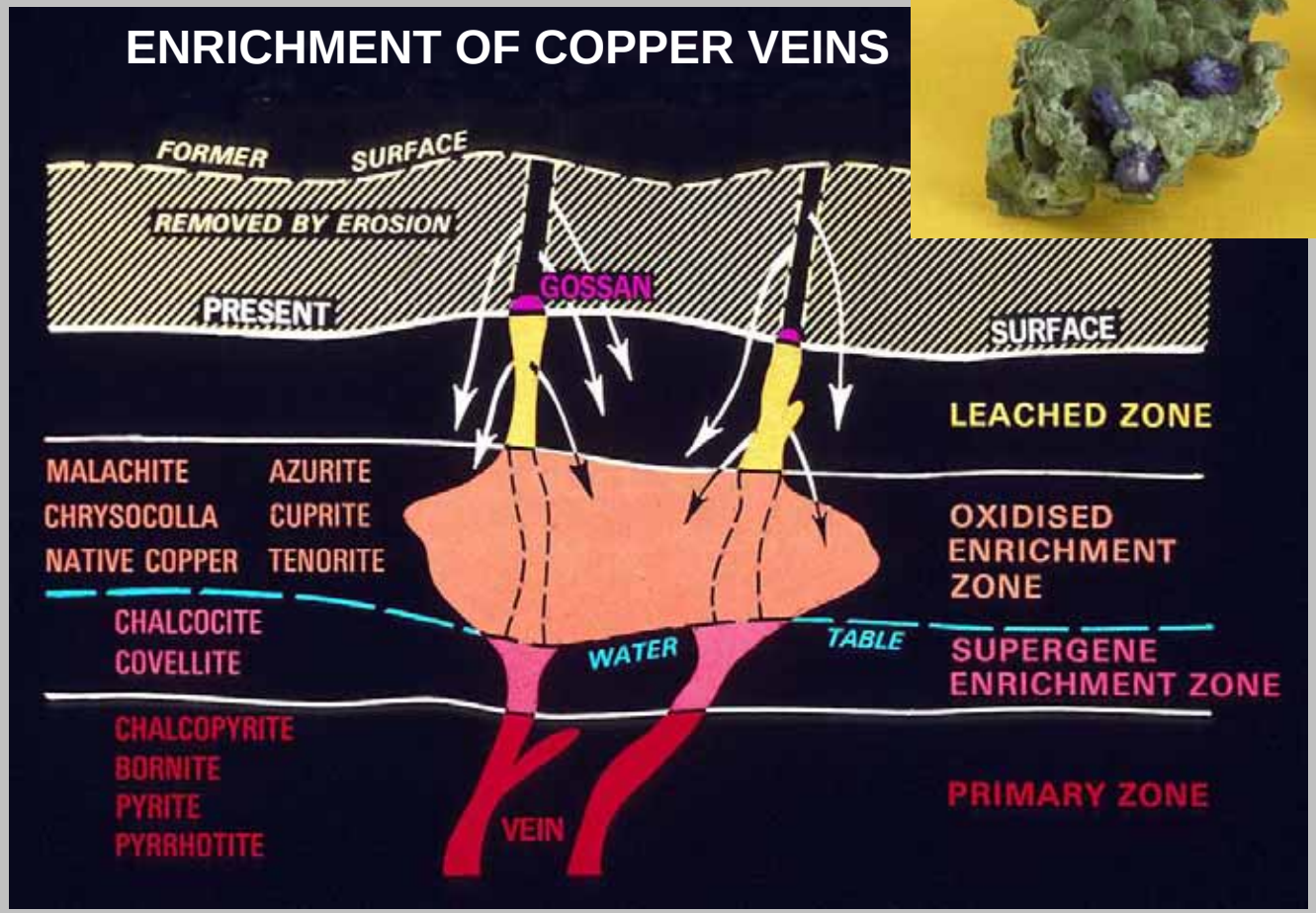
Kapunda Mine

- In 1842, copper ore discovered on pastoral leases of Francis Dutton and Charles Dutton
- keeping their discovery a secret they had an 80 acre section surveyed around the deposit and purchased it for £80 in 1843
- mining commenced in 1844 and resulted in Australia's first commercial mine
- the discovery of the brightly coloured copper ore began a period known as - ***Coppermania***



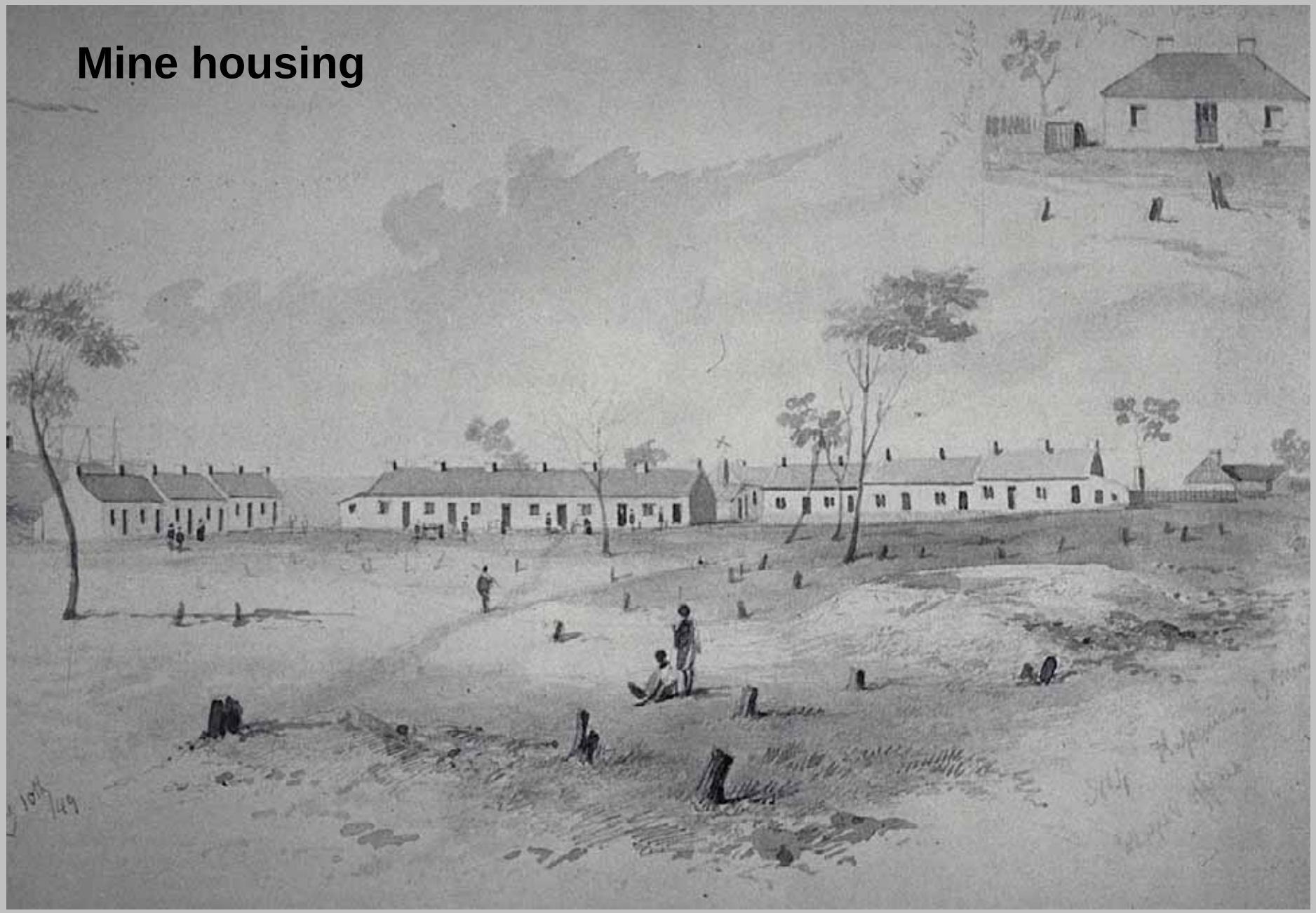
“Coppermania”

Malachite and azurite, Kapunda Mine

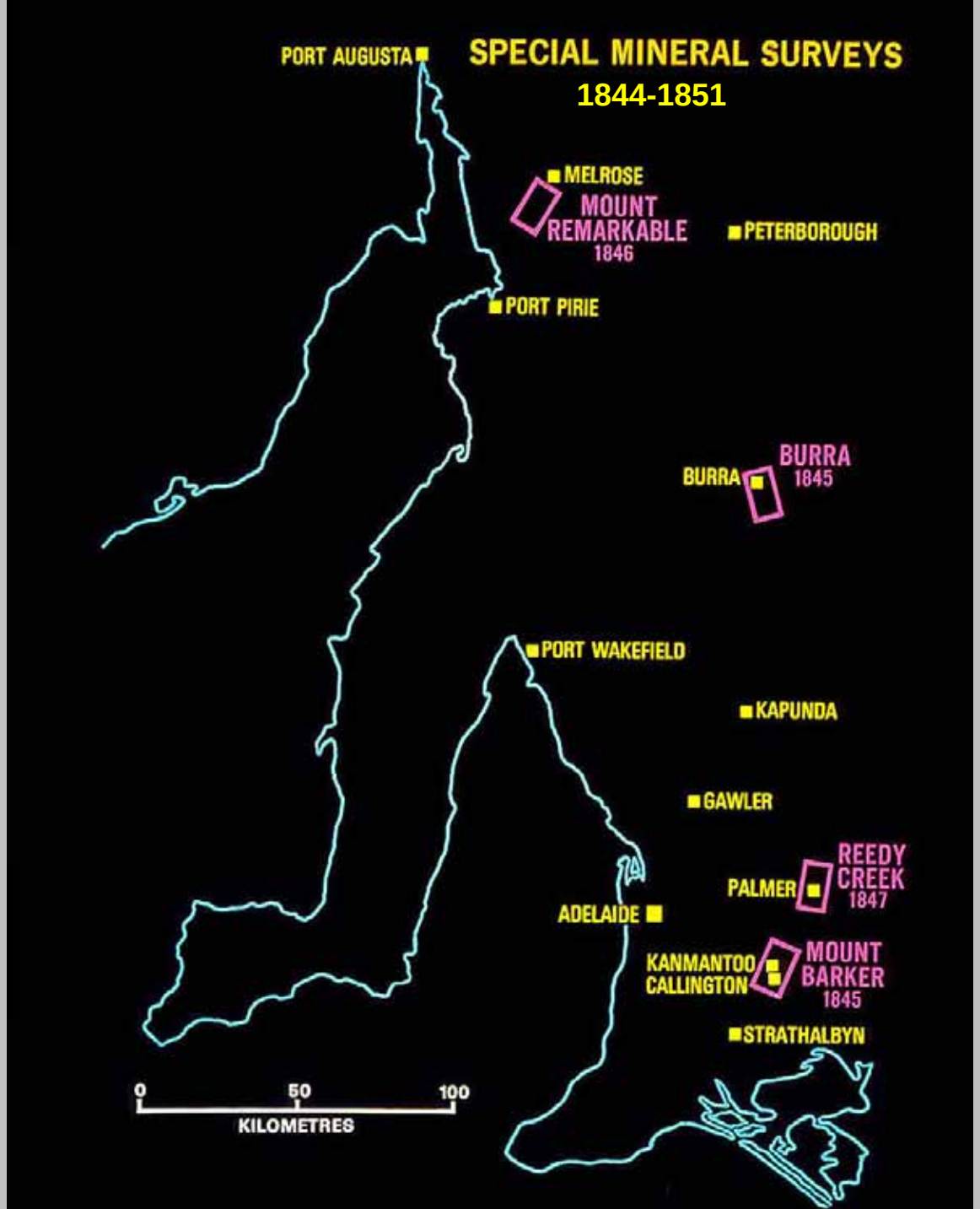


Kapunda Mine, 1845 by S.T. Gill

Mine housing

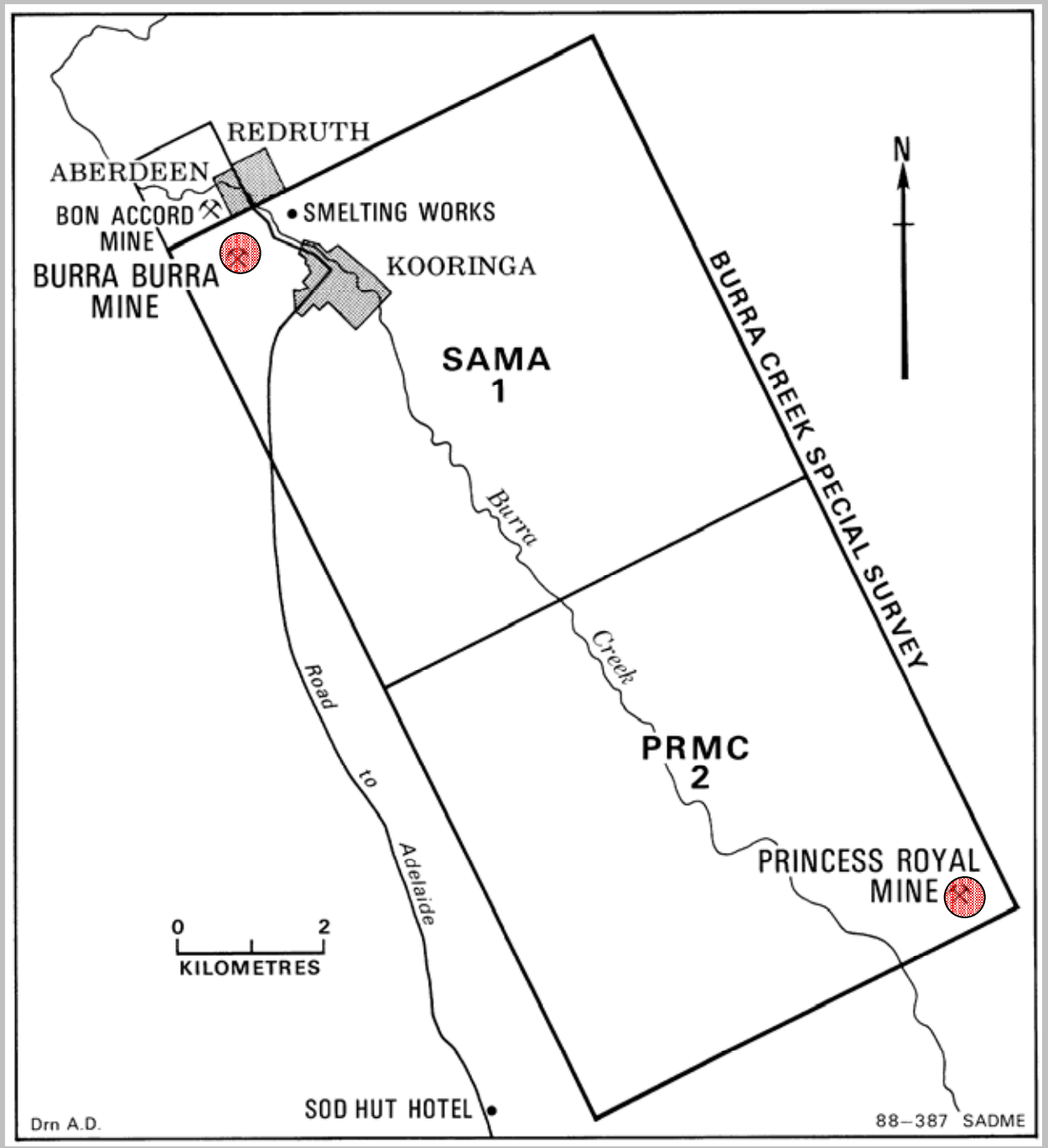


Mine Square cottages, Kapunda, 1849 by S.T. Gill


SPECIAL MINERAL SURVEYS
1844-1851
PORT AUGUSTA
MELROSE
MOUNT REMARKABLE
1846
PETERBOROUGH
PORT PIRIE
BURRA
BURRA
1845
PORT WAKEFIELD
KAPUNDA
GAWLER
PALMER
REEDY CREEK
1847
ADELAIDE
KANMANTOO
CALLINGTON
MOUNT BARKER
1845
STRATHALBYN
0
50
100
KILOMETRES

Burra Creek Special Survey 1845

- in 1845, two shepherds discovered copper ore at separate sites near Burra Creek
- two groups were formed to jointly purchase the survey - the *Nobs* and the *Snobs*
- the survey measuring 8x4 miles (the *Monster Mine*) was purchased for £20,000 and divided in two, each half containing one outcrop of ore
- the Nobs won a lot and drew the southern half and the Princess Royal Mine
- the Snobs were left with what became the Burra Mine



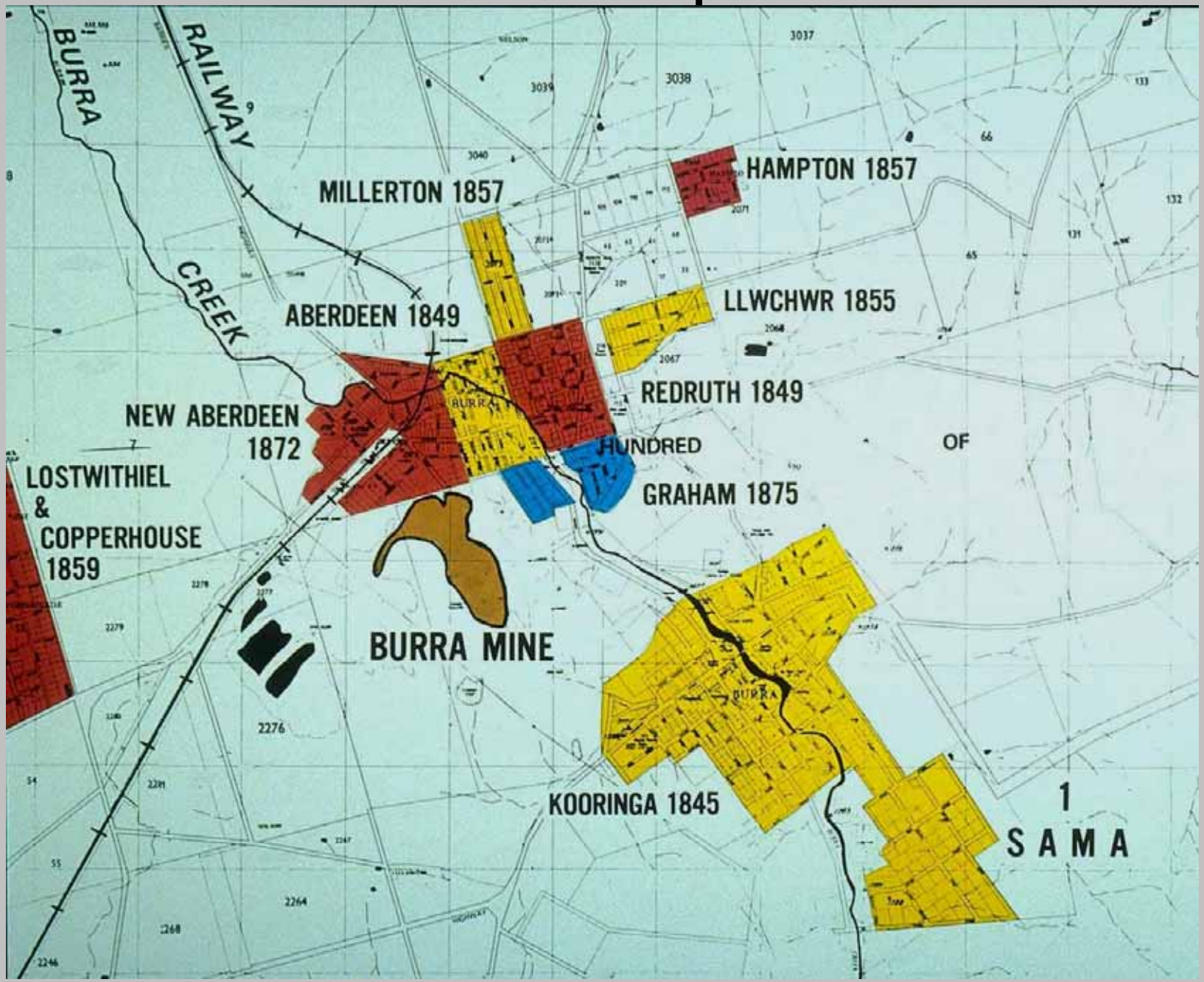
Burra Mine

- mining commenced in Sept 1845
- by 1850, the largest mine in Australia producing 23,000 t of ore
- produced 80,000 t of ore up to 1851 – 2/3 of SA production
- 1000 men and boys employed

Burra Mine, 1849 by S.T. Gill

Burra Smelting Works 1849 by S.T. Gill

Burra Townships



Burra Townships

Company housing

Kooringa, 1872

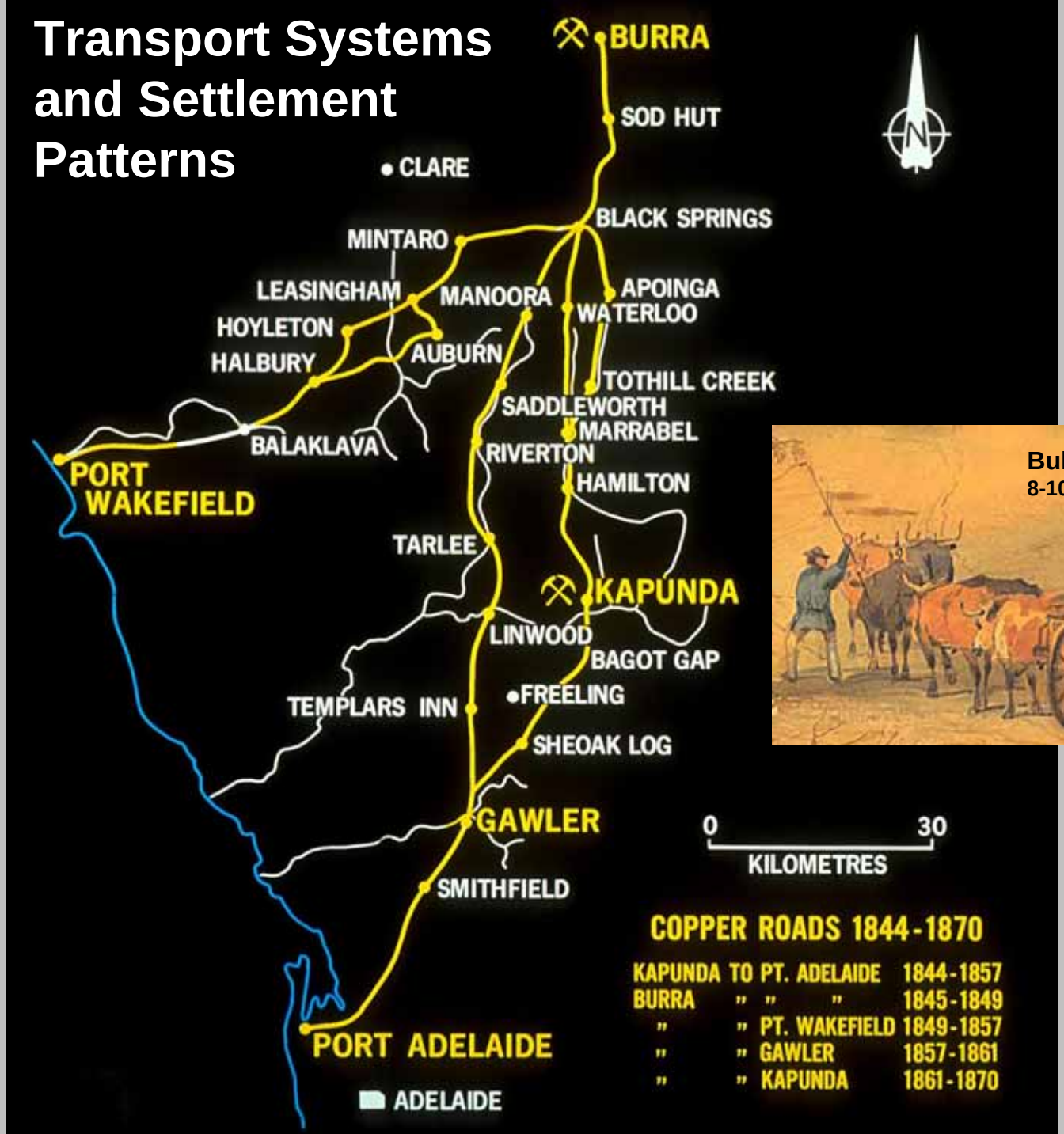

Paxton Square cottages - 1850


Thames St cottage - 1846

Housing - Burra dugouts

Miners Dugouts, 1850 by William Cawthorne

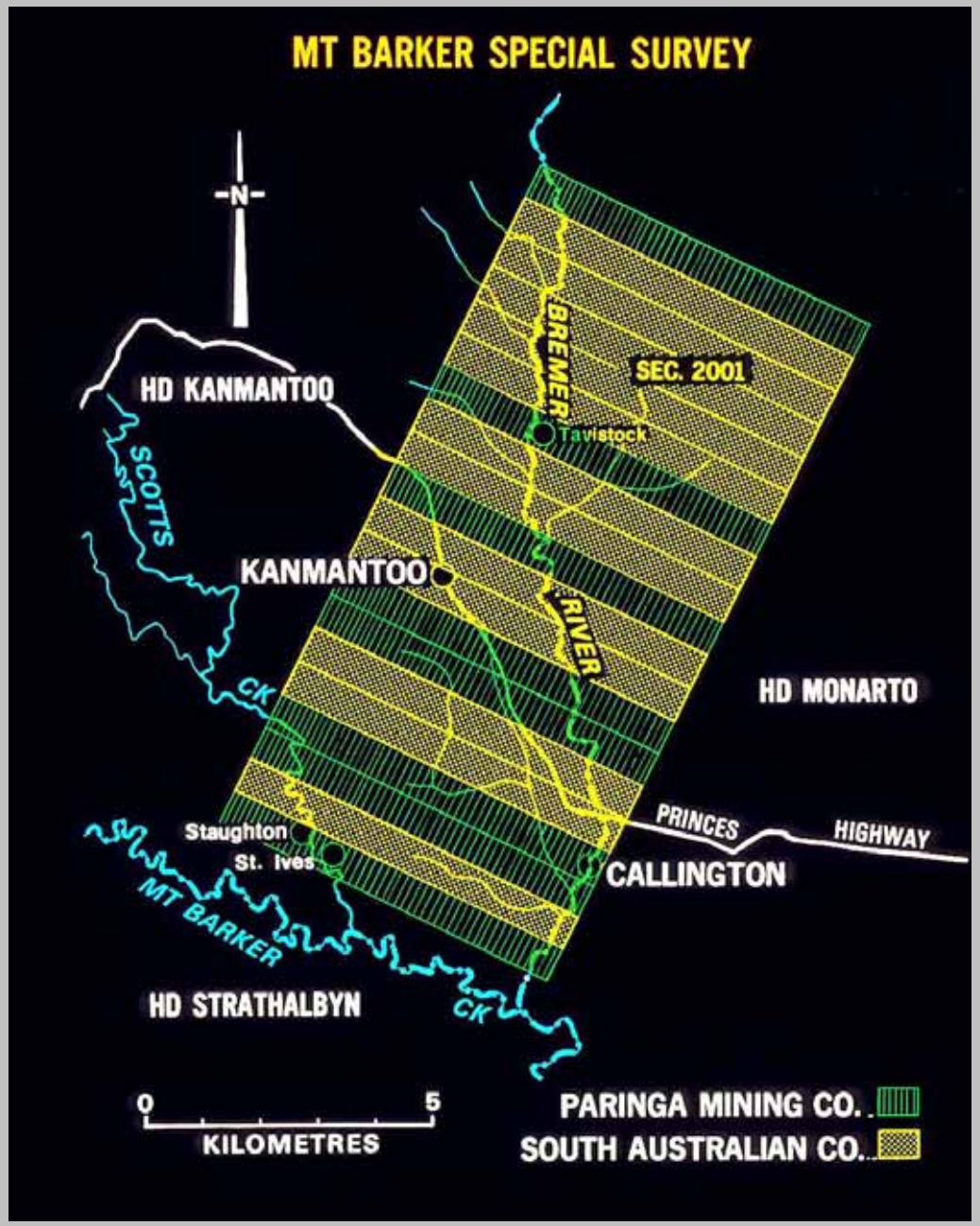
Transport Systems and Settlement Patterns



Bullock dray
8-10 miles per day

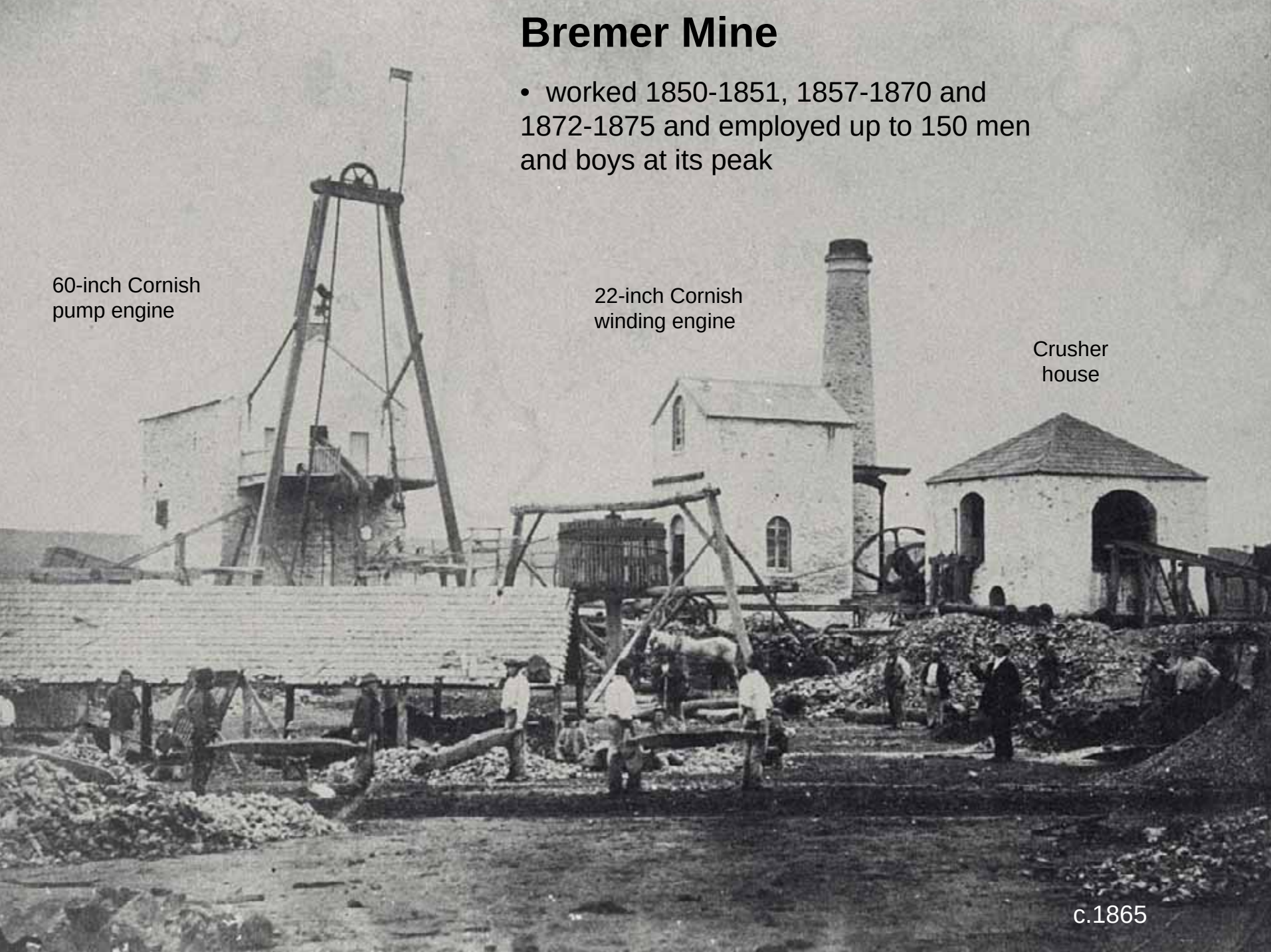
Mount Barker Special Survey 1845

- Copper ore discovered by two Cornish miners near Kanmantoo in 1845
- a Special Survey jointly purchased by PMC and SAC
- divided into 20 strips of 1000 acres and choice of first strip won by SAC
- Mining commenced in 1846 and by 1850 a number of mines operating most bearing the names of famous Cornish mines
- the most important mines were Kanmantoo, Bremer and Paringa

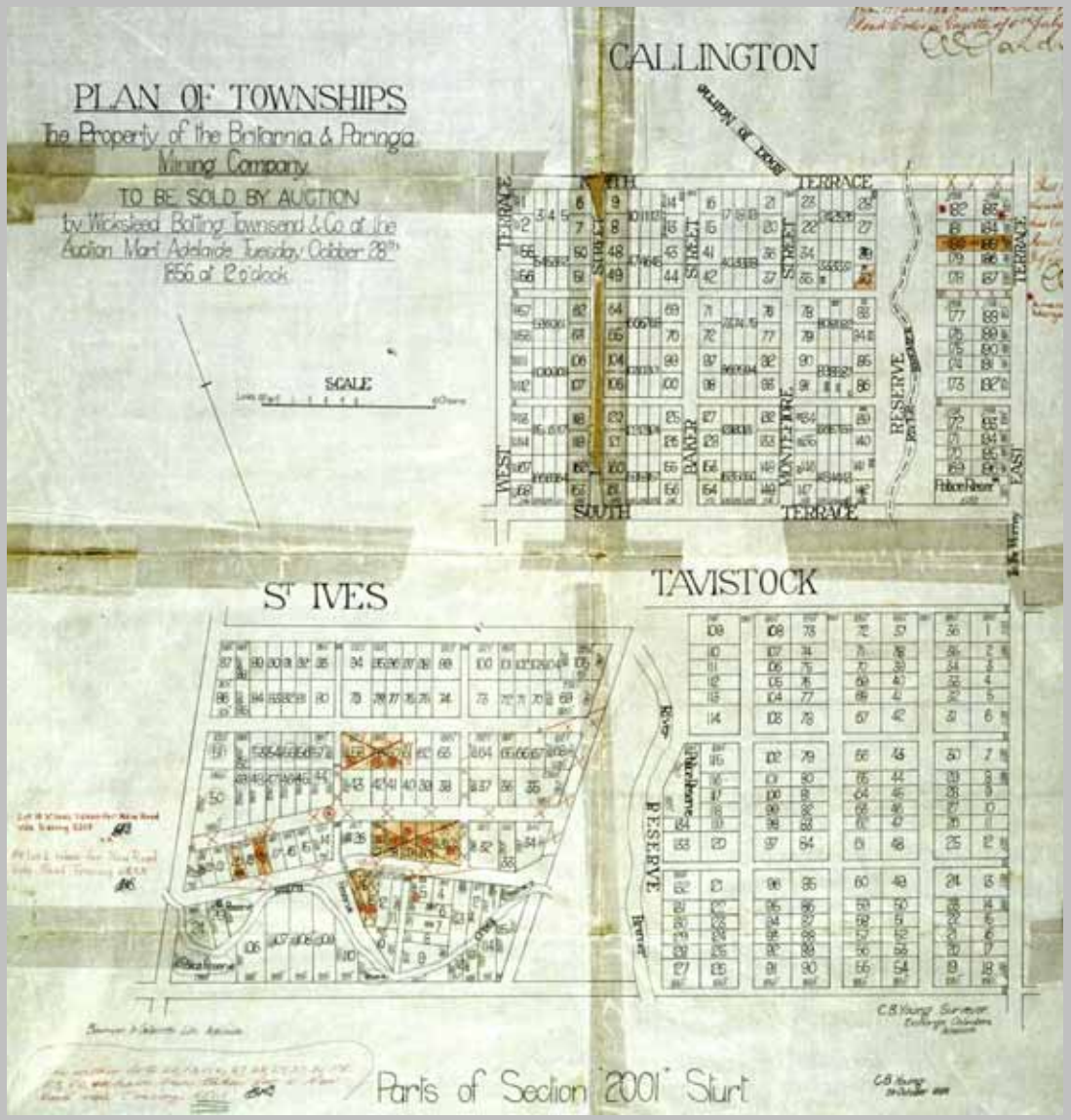


Bremer Mine

- worked 1850-1851, 1857-1870 and 1872-1875 and employed up to 150 men and boys at its peak



Early mining townships, Mt Barker district

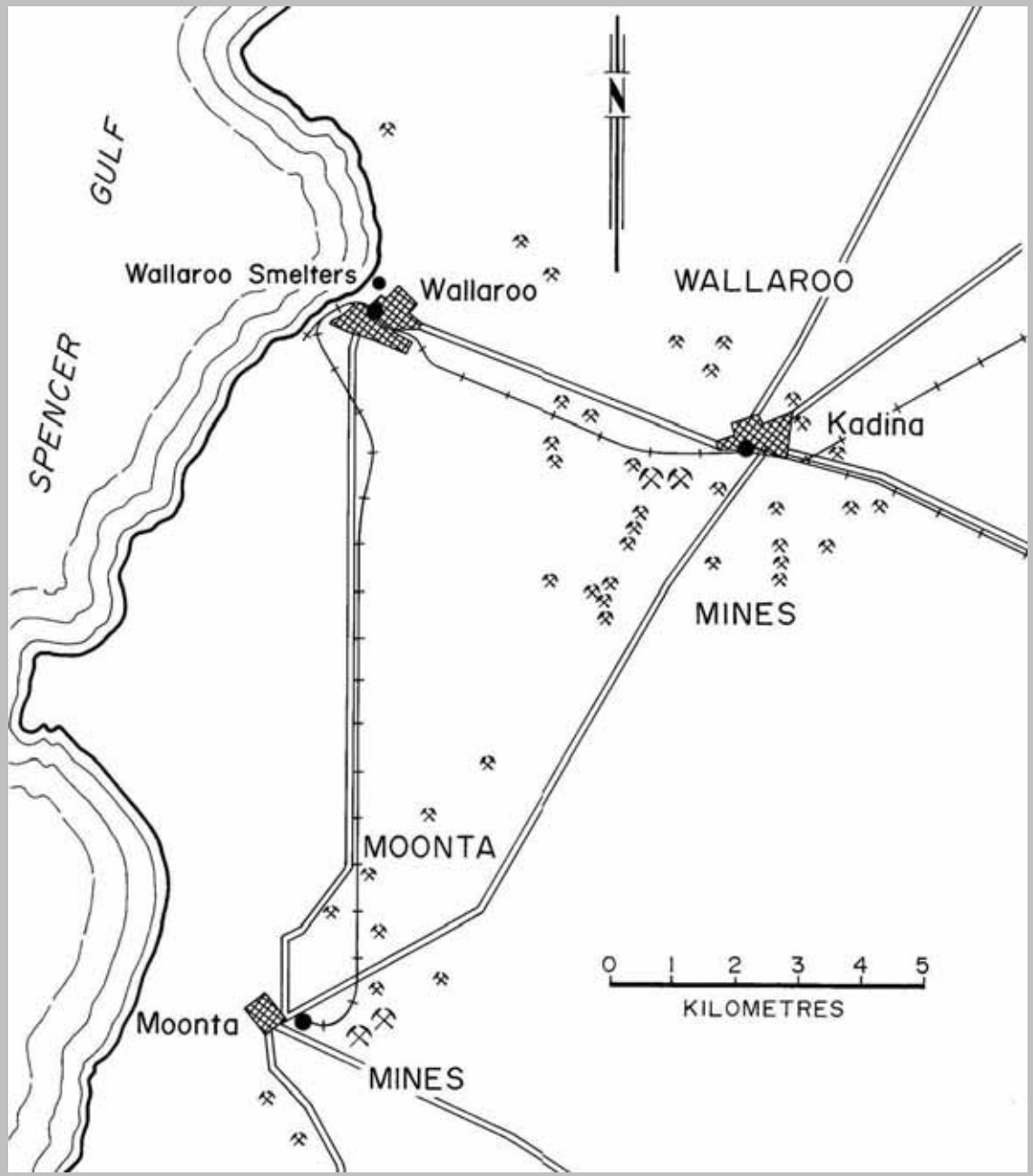



Callington


Ruin, St Ives

Moonta-Wallaroo Mining District

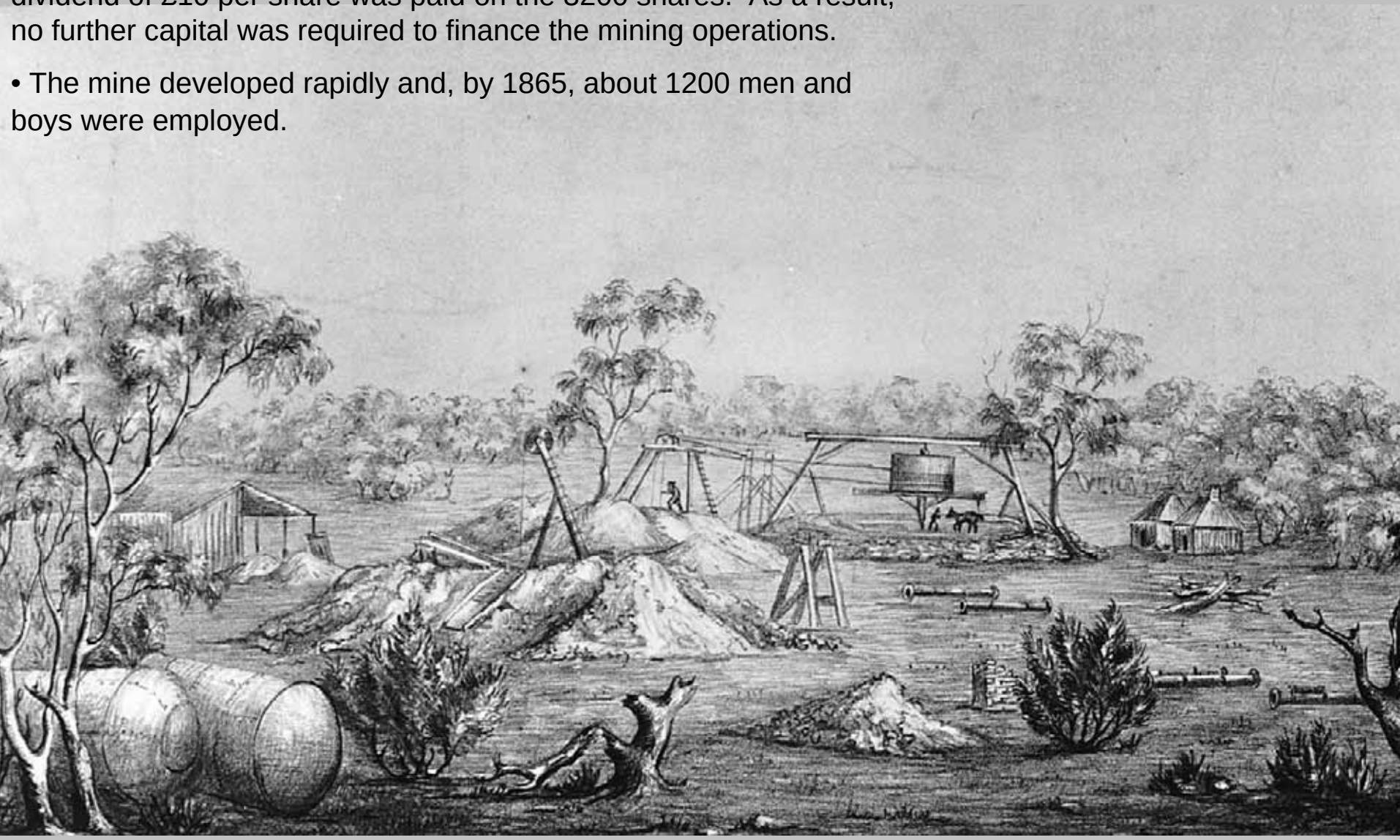
- in 1859 and 1861, shepherds discovered copper ore on the surface.
- Wallaroo Min.Co. and Moonta Min.Co. were formed to work the deposits.
- discoveries made at a time when the earlier rich deposits at Kapunda and Burra were in decline.
- caused a rush for leases near the two mines.
- amalgamated in 1890 and operated for more than 60 years.
- total production of 335,000 t of copper from 7 mt of ore.
- peak of activity in the 1870s when the mines employed more than 3000 and district population was 20,000.



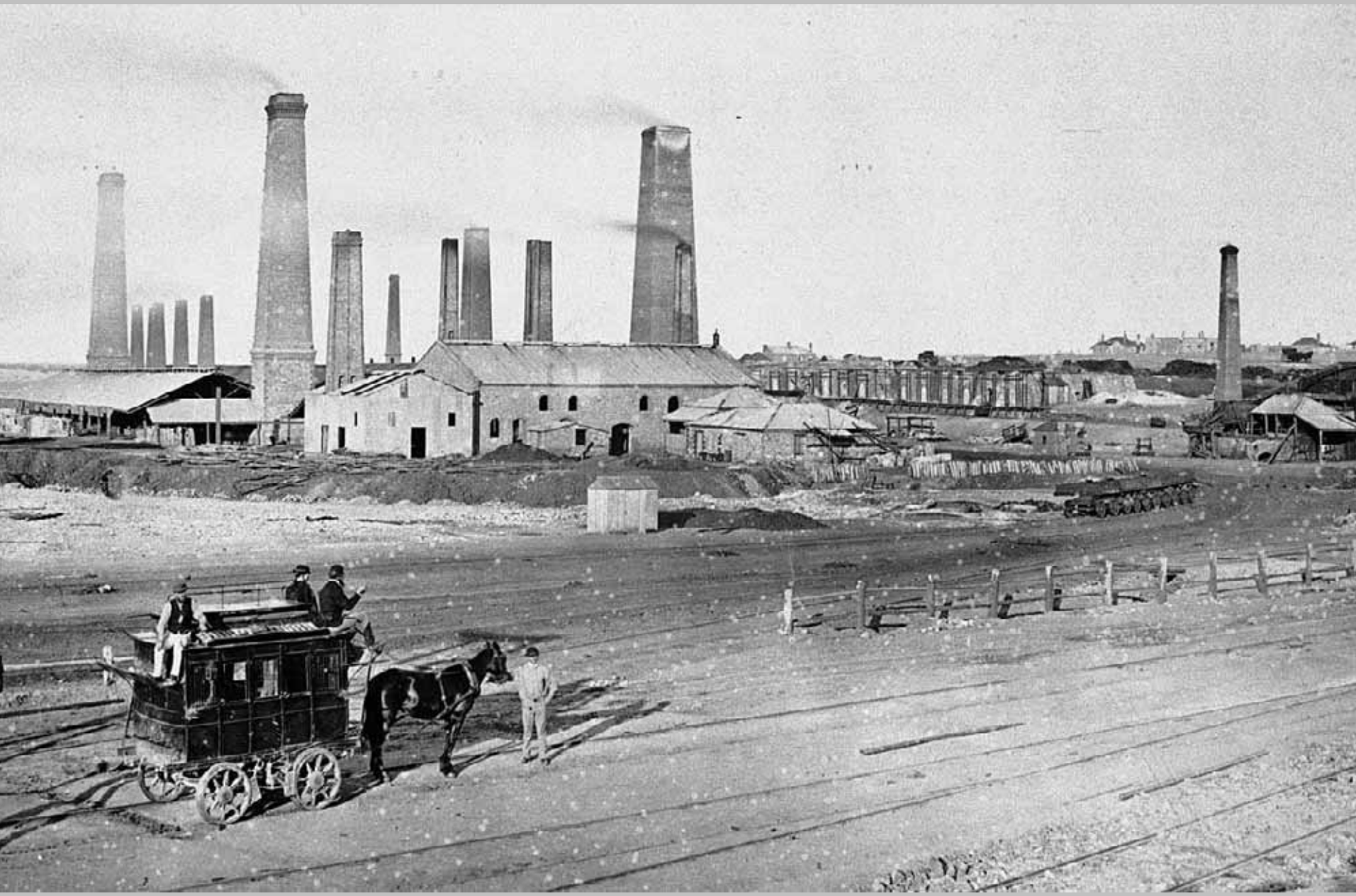
Moonta Mine

• The Moonta Mine was rich from the outset, with nearly 5000 tons of ore worth £67,350 produced in the first year of operation, on which a dividend of £10 per share was paid on the 3200 shares. As a result, no further capital was required to finance the mining operations.

• The mine developed rapidly and, by 1865, about 1200 men and boys were employed.



Elders Shaft, Moonta Mine, 1863

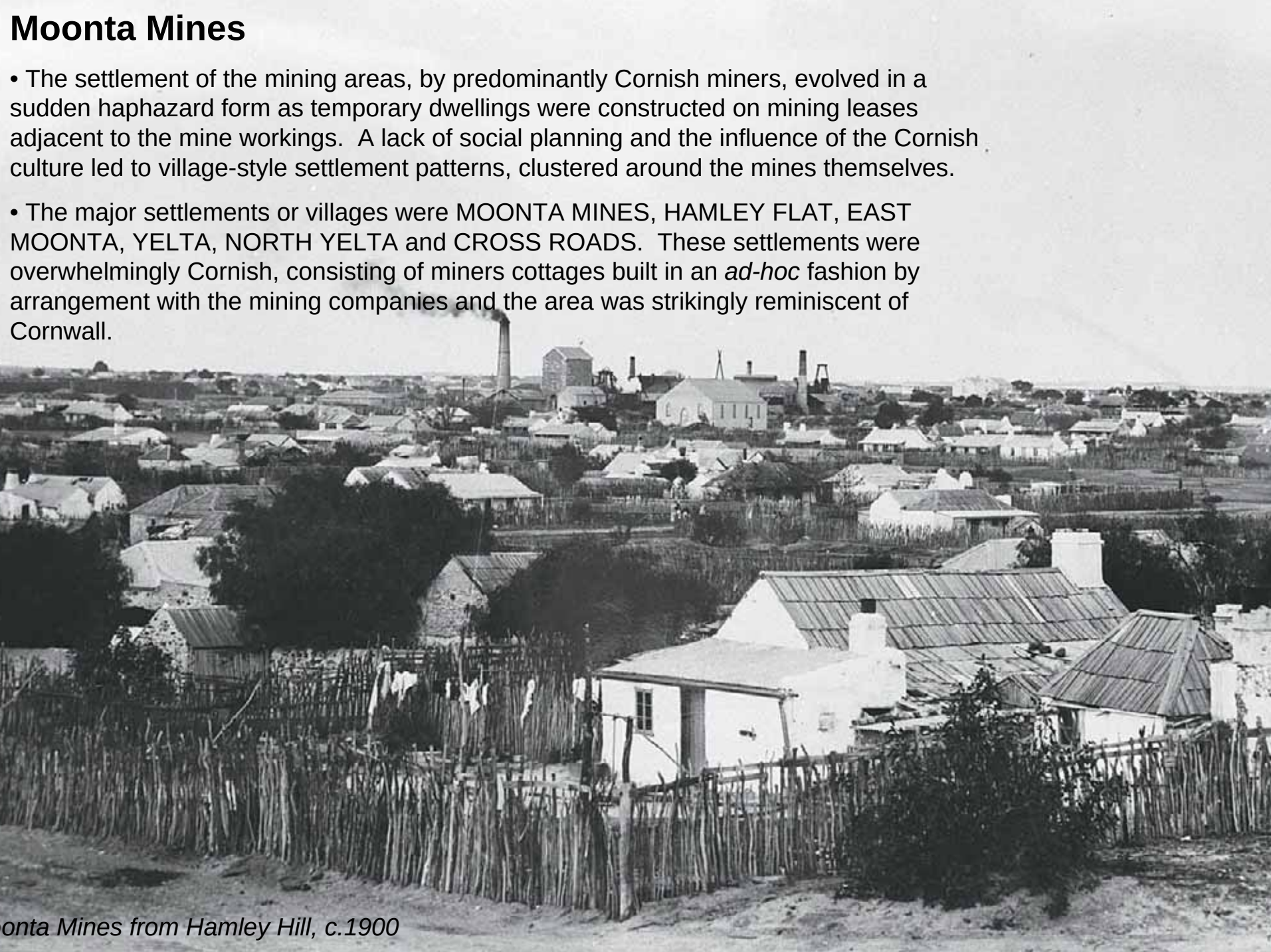


Wallaroo Smelting Works, c.1870

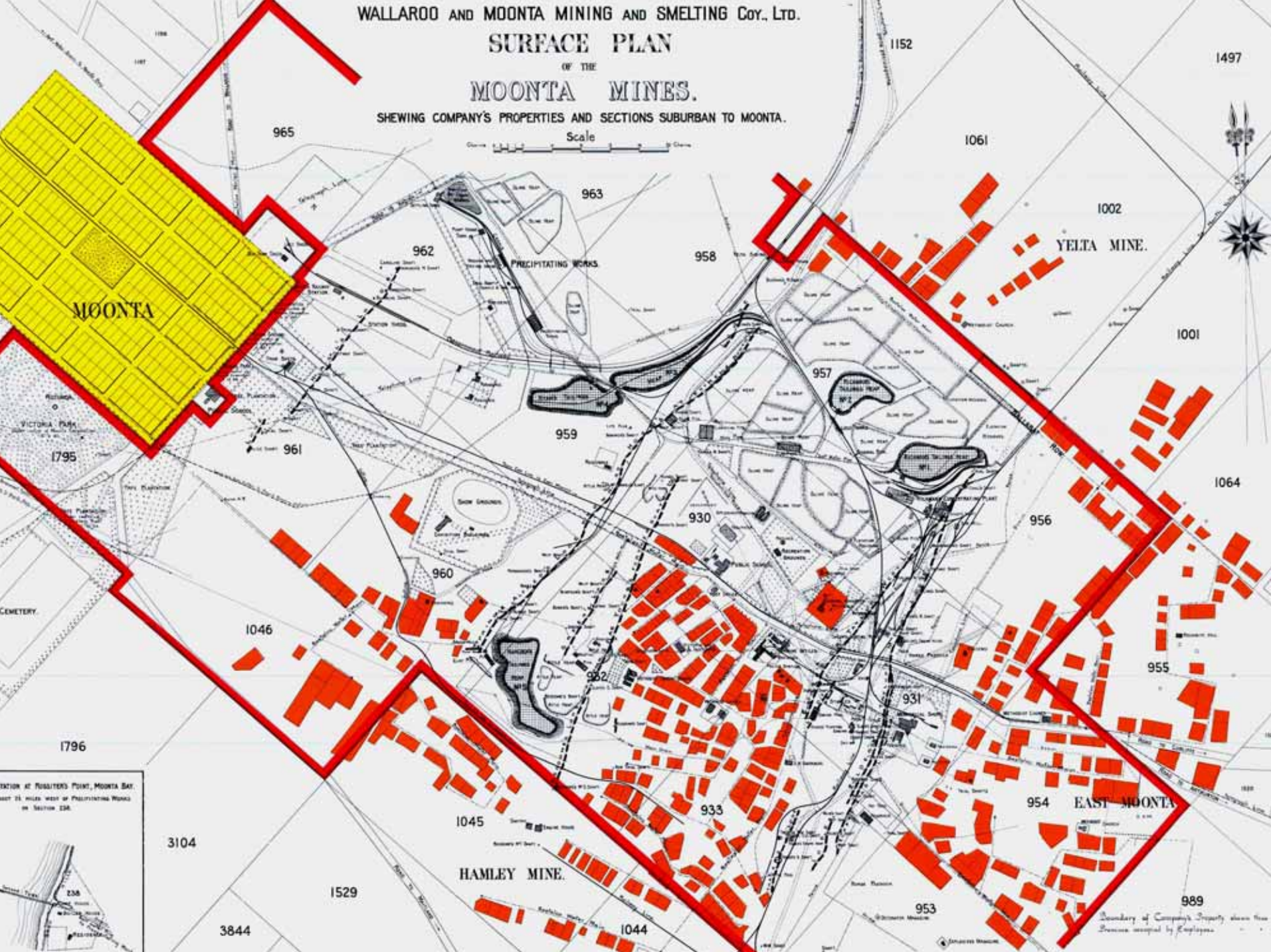
Moonta Mines

• The settlement of the mining areas, by predominantly Cornish miners, evolved in a sudden haphazard form as temporary dwellings were constructed on mining leases adjacent to the mine workings. A lack of social planning and the influence of the Cornish culture led to village-style settlement patterns, clustered around the mines themselves.

• The major settlements or villages were MOONTA MINES, HAMLEY FLAT, EAST MOONTA, YELTA, NORTH YELTA and CROSS ROADS. These settlements were overwhelmingly Cornish, consisting of miners cottages built in an *ad-hoc* fashion by arrangement with the mining companies and the area was strikingly reminiscent of Cornwall.



onta Mines from Hamley Hill, c.1900


WALLAROO AND MOONTA MINING AND SMELTING COY., LTD.
SURFACE PLAN
OF THE
MOONTA MINES.
SHEWING COMPANY'S PROPERTIES AND SECTIONS SUBURBAN TO MOONTA.
Scale
MOONTA
YELTA MINE.
EAST MOONTA
HAMLEY MINE.
PRECIPITATING WORKS
965
963
962
958
1152
1497
1061
1002
1001
957
959
961
1795
1064
956
930
960
1046
955
931
1796
954
933
1045
3104
1529
953
989
3844
1044
Boundary of Company's Property shown thus

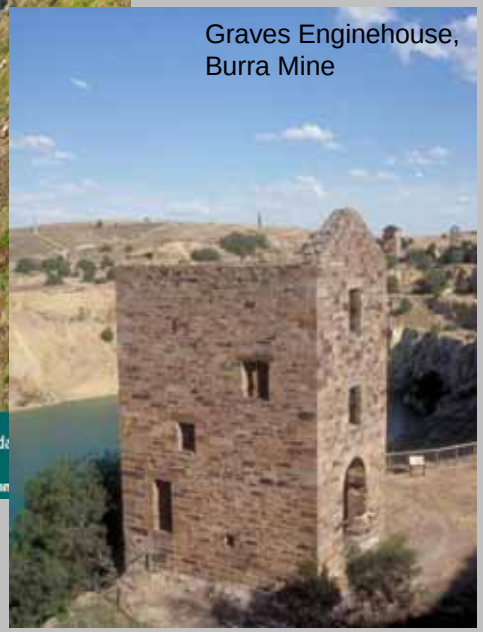
Mining Heritage

•The mining landscapes of Cornwall received World Heritage Status in 2006 with a serial listing of 10 sites

• UK government strongly supports an extension of the Cornish Mining WHS as a transnational proposal to include Burra and Moonta (mines and townships) along with sites in Mexico, South Africa and Spain

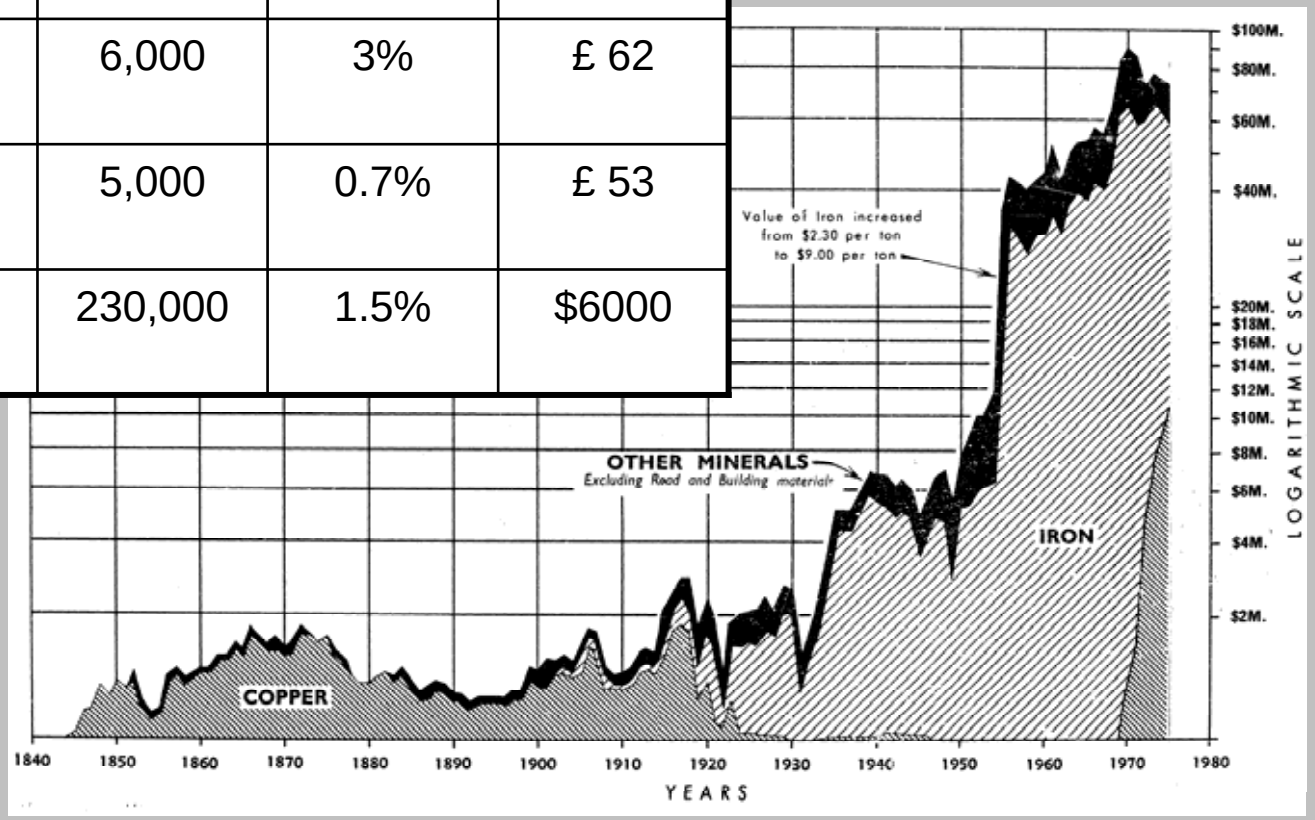
CORNISH MINING web site


Miner's cottage, Moonta Mines


Graves Enginehouse, Burra Mine

SA Copper Production
(tonnes)

Year	World	South Australia	SA as % of World	Copper Price
1850	40,000	4,000	10%	£ 85
1870	82,000	7,000	6%	£ 72
1880	180,000	6,000	3%	£ 62
1900	700,000	5,000	0.7%	£ 53
2006	15 mill	230,000	1.5%	$6000



Impact of Moonta-Wallaroo vs Olympic Dam

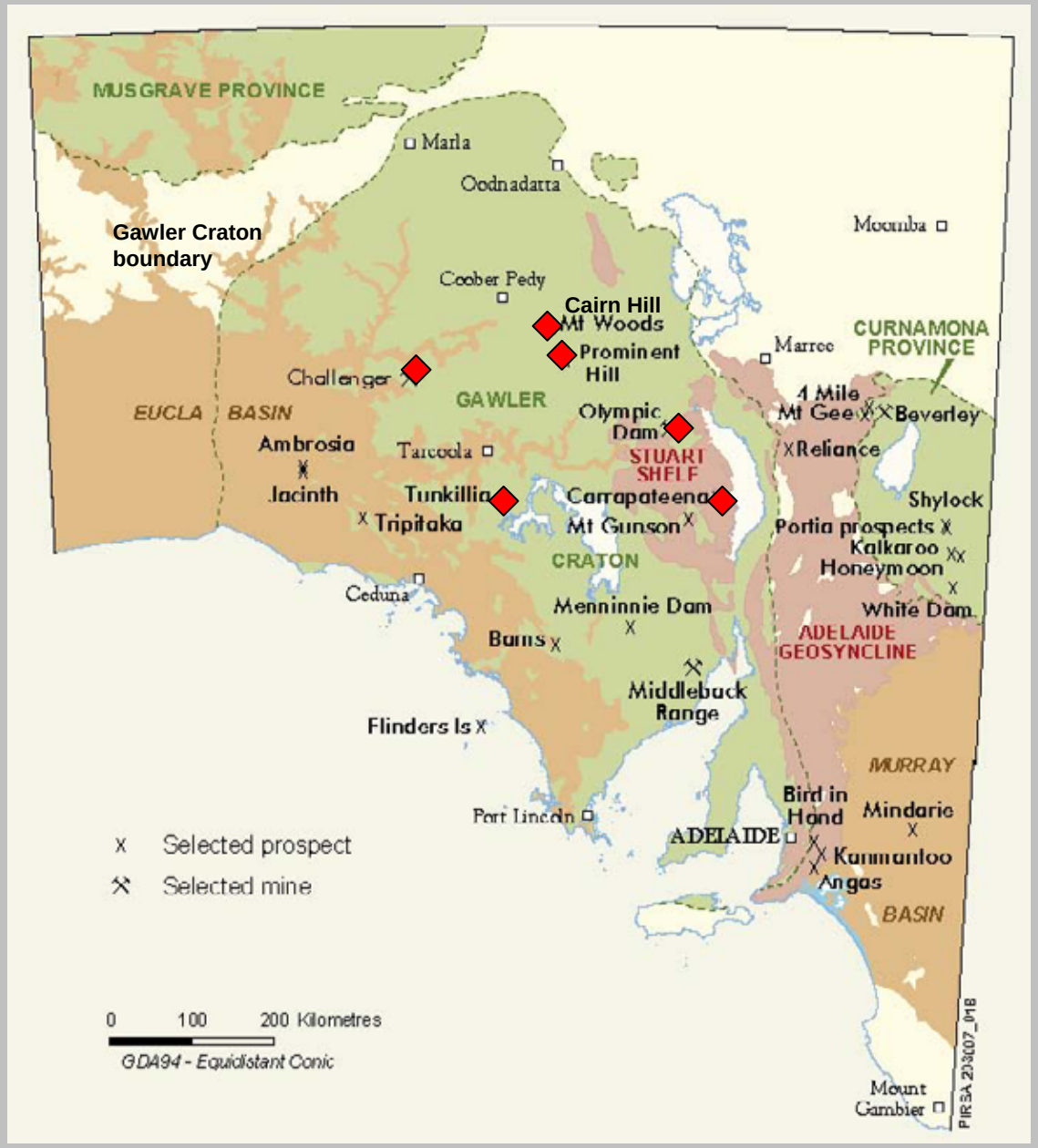
	Moonta-Wallaroo	Olympic Dam
Period Worked	1861 - 1923	1988 - ?
Reserves		4.4 billion t @ 1.1% cu 48 mt cu 1.8 Mt U, 60 Moz Au
Copper Production	335,000 t	Current - 230,000 t Expansion – 500,000 t
% of World Production	6% - 1870 0.7% - 1906	1.5%
% of SA Production	64% - 1906	Approx 60% - 2006
Employment	2700 peak - 1906	1800 – permanent 1080 - contractors
Population supported	20,000 in 1875	5,000 in 2006

The Current Mining Boom

Gawler Craton

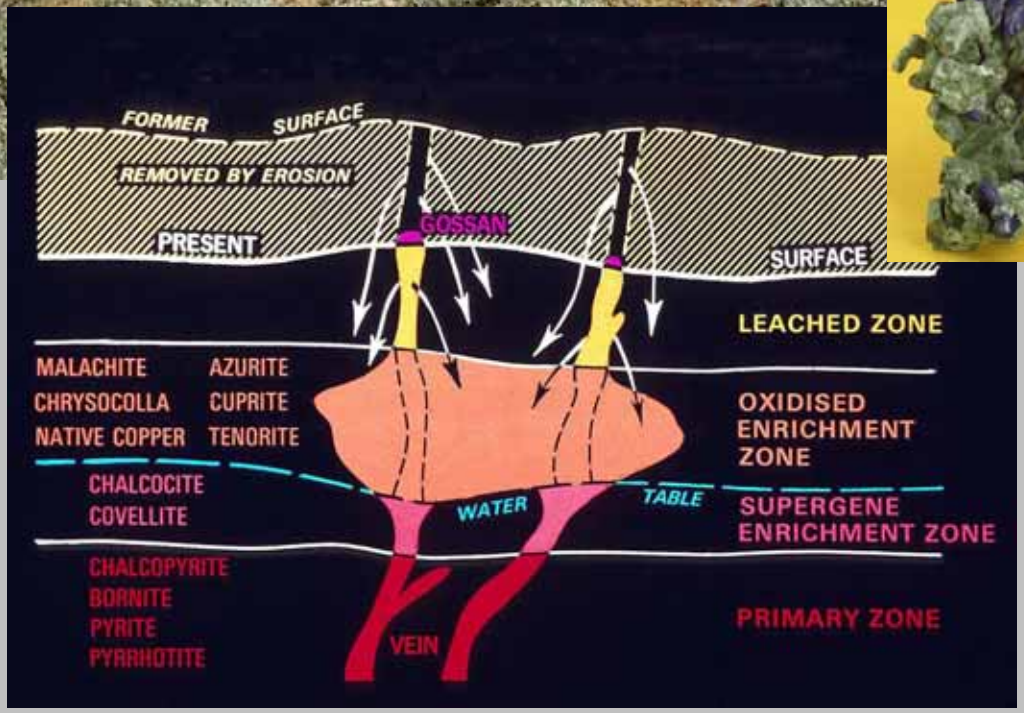
Mines and emerging projects

- **Olympic Dam Mine** 1975
  Cu-Au-U
- **Challenger Mine** 1995
  Gold
- **Prominent Hill Mine** 2001
  Cu-Au
- **Cairn Hill Deposit** 2005
  Fe-Cu-Au
- **Tunkillia Deposit** 1995
  Gold
- **Carrapateena Prospect** 2005
  Cu-Au



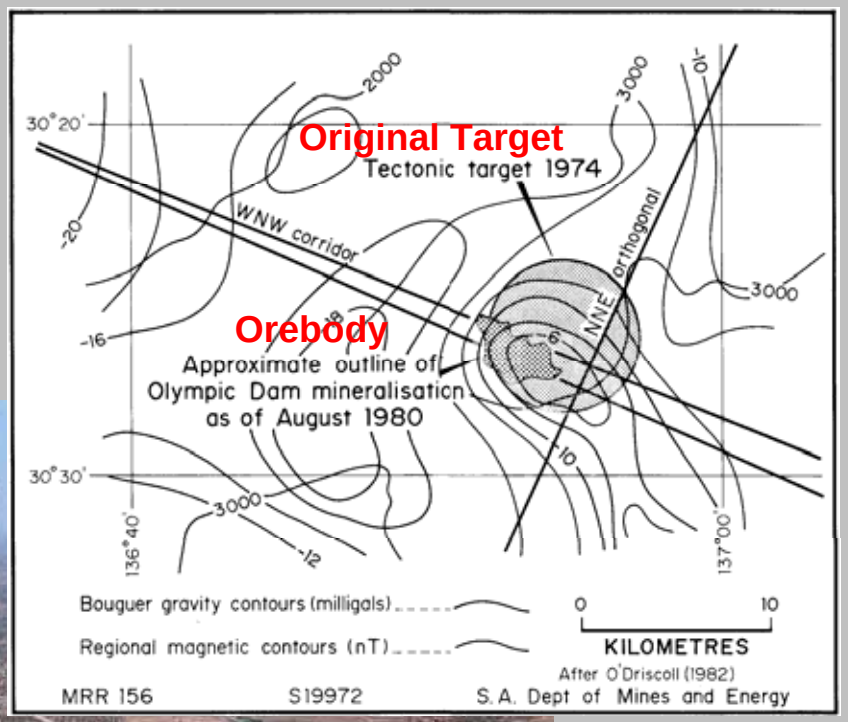
The Gawler Craton

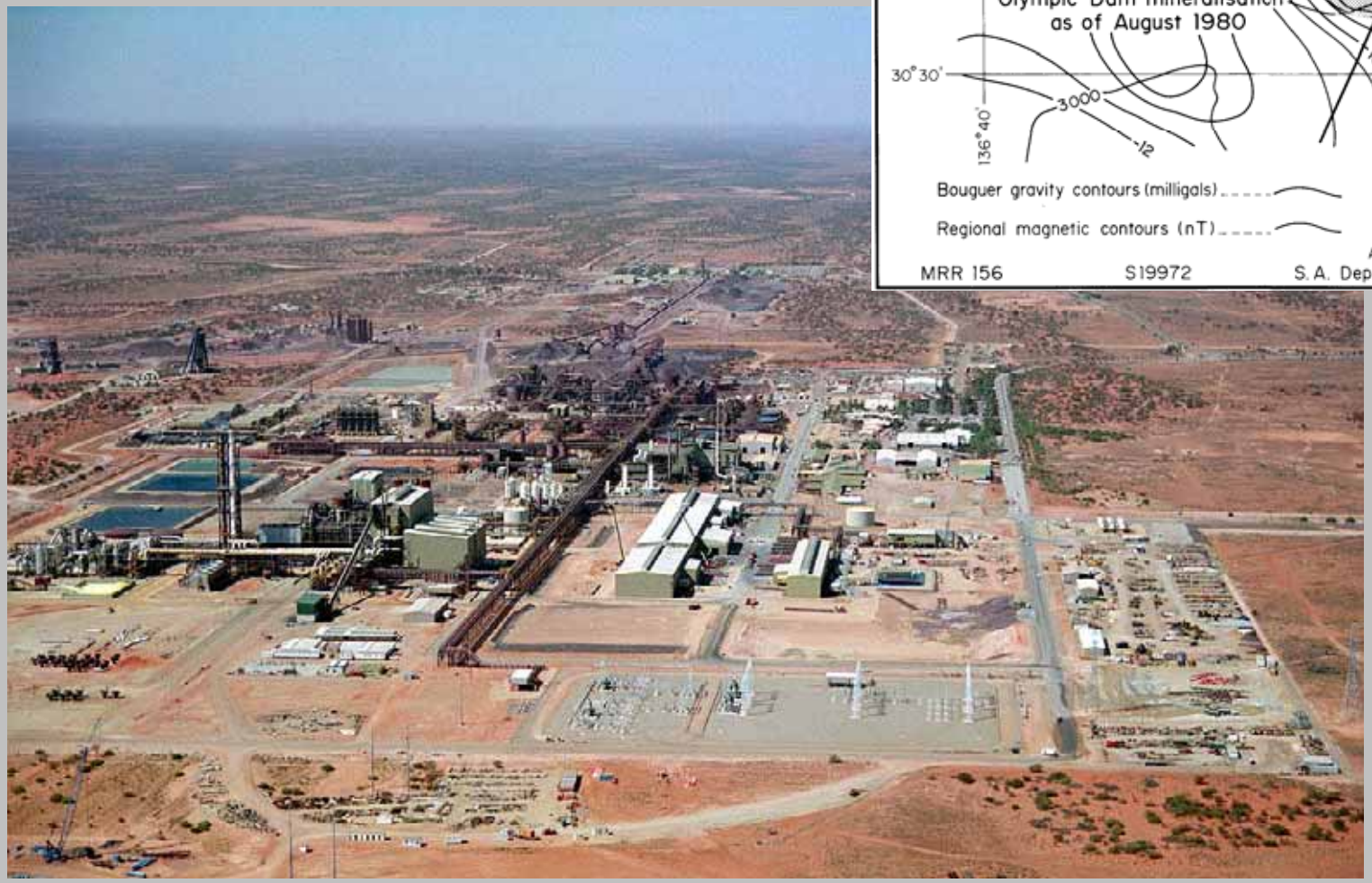
Typical Gawler Craton landscape – vast areas with no outcrop



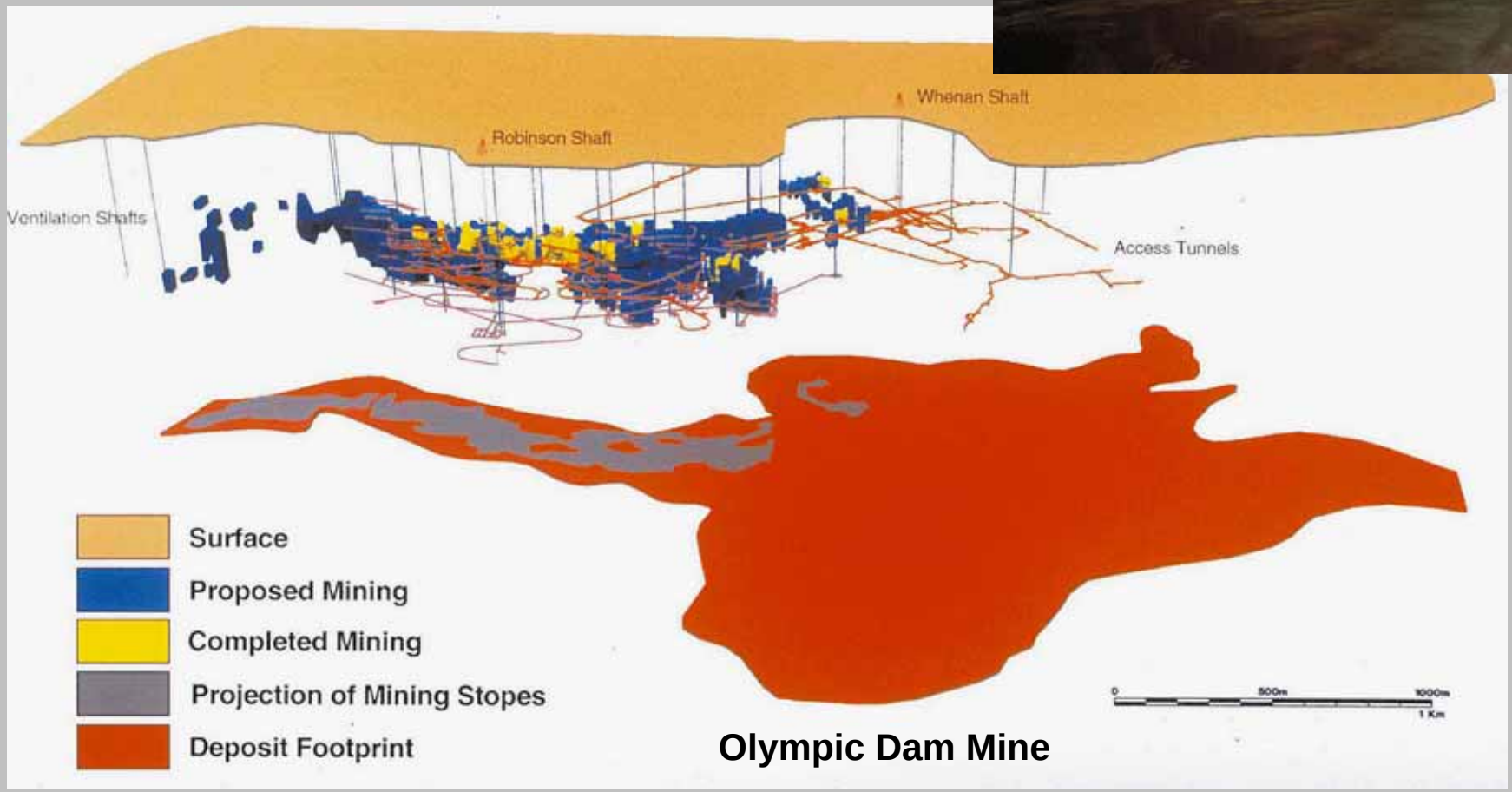
Olympic Dam Mine

- discovered in 1975 as a result of innovative scientific exploration
- first drill hole sited to test a combination of geophysical and tectonic models intersected Cu-U mineralisation below 350m of sediments





- World's largest Cu-U deposit – 4.4 Bt ore @ 1.1% Cu
- Deposit measures 7 x 4 km and 1000 m deep
- Current production 230,000 t of Cu and 3.3 t of Au
- After the expansion will be the World's largest open cut mine measuring 4.5x 1.5 km and 1 km deep

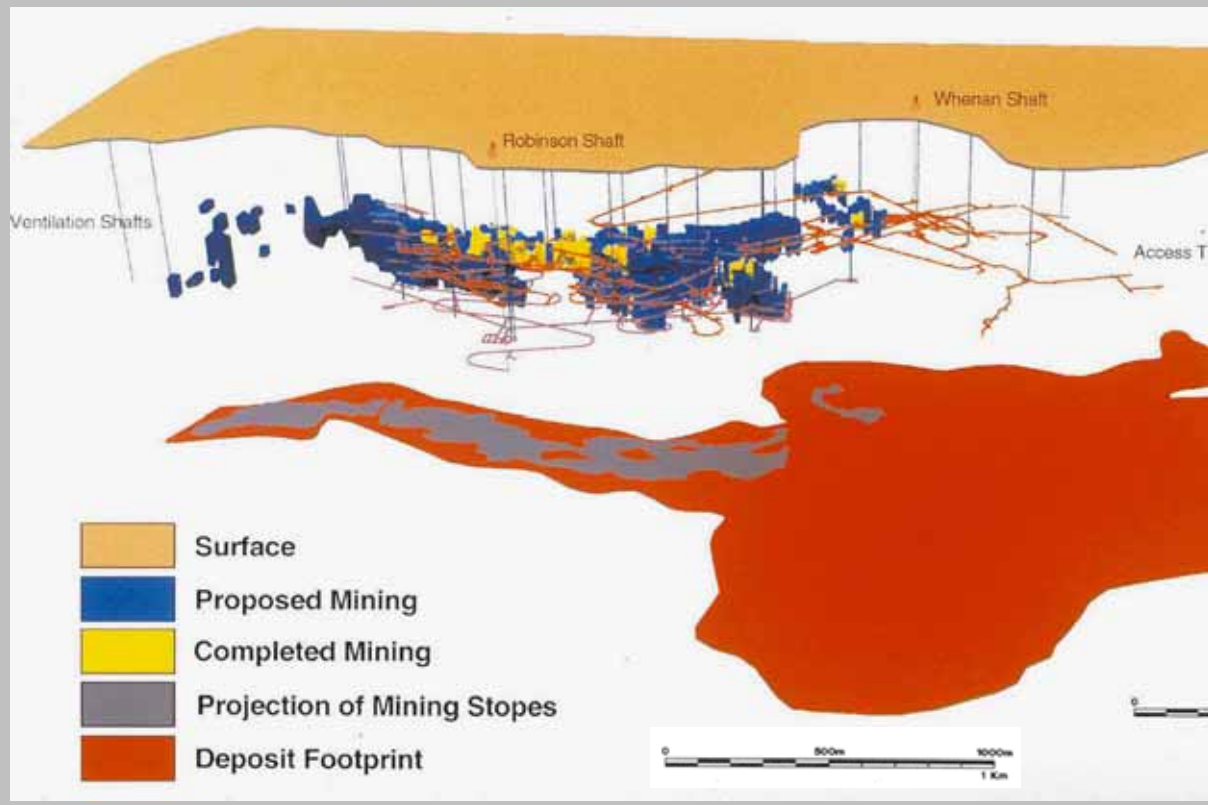


Olympic Dam Mine

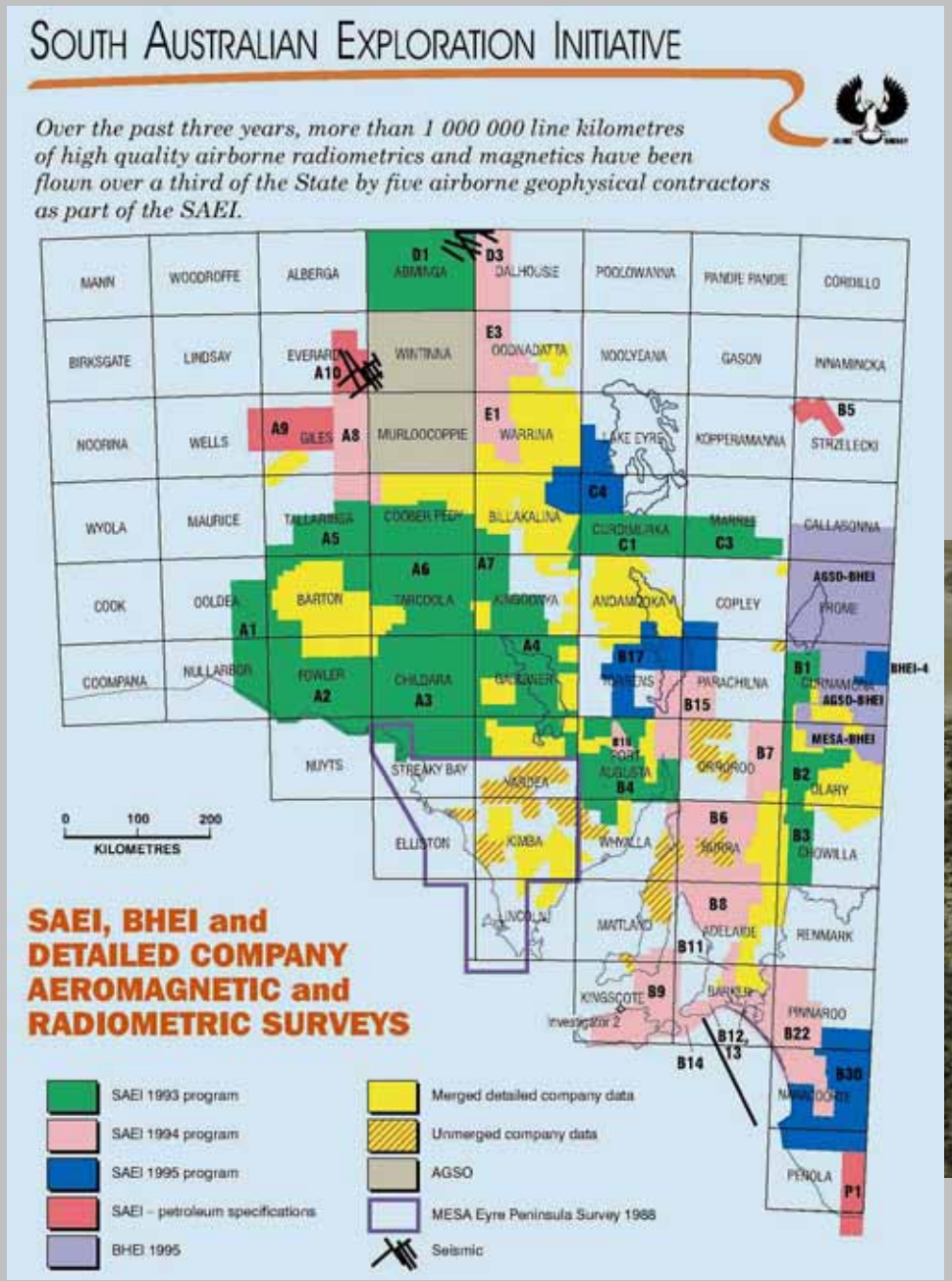
	Burra Mine	Wallaroo Mine	Olympic Dam Mine
	50,000t Cu	180,000t Cu	48 Mt
	1845-1877	1861-1923	

Section

Plan



SA Exploration Initiatives



Between 1993 and 1996 the SA Govt. invested $20M in geoscientific information in areas which were under-explored due to the lack of outcrop but highly prospective by:

- provision of airborne geophysical data at low cost
- bedrock drilling
- database development

Aeromagnetic survey plane fitted with a magnetometer in the tail stinger which senses the variation in the Earth's magnetic field caused by magnetic minerals.

Total Magnetic Intensity (TMI) map

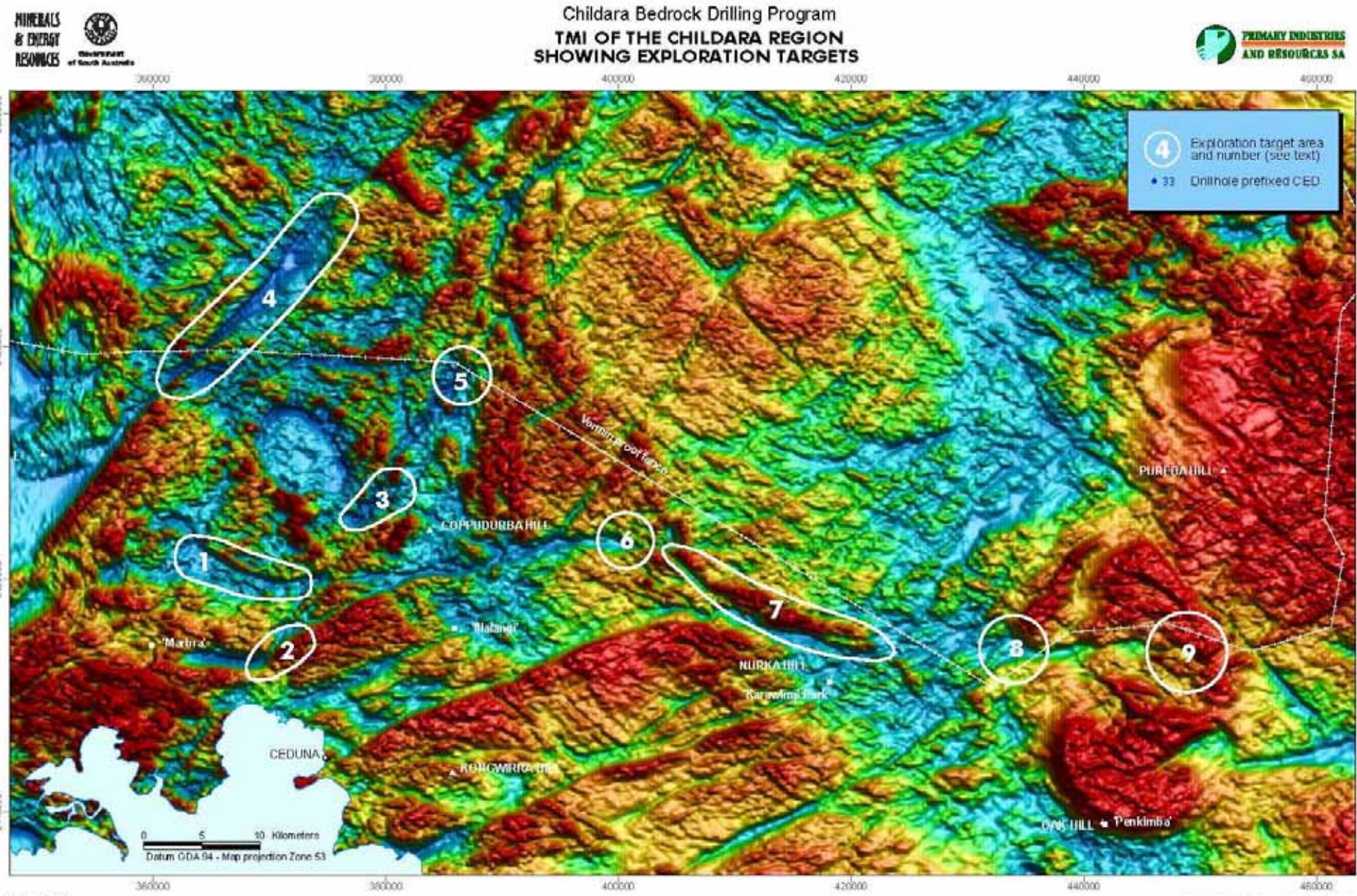
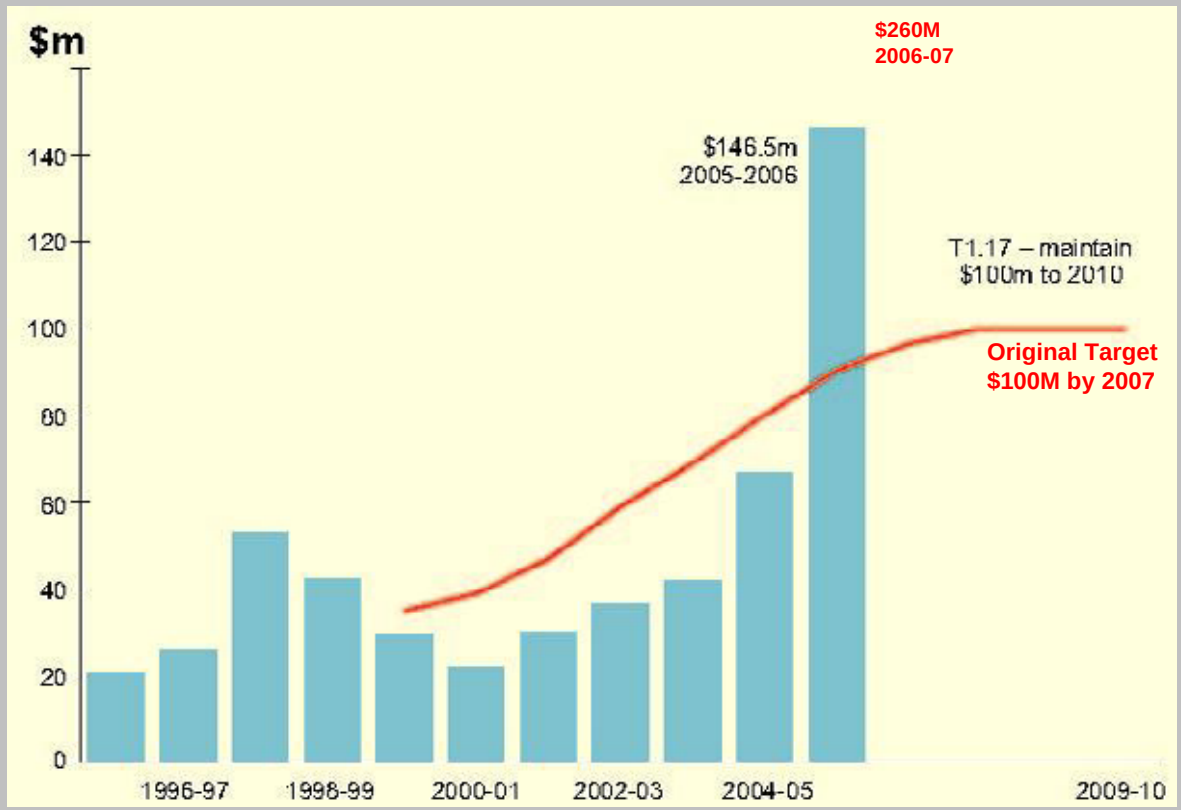


Figure 13

PIRSA Publishing Services AV : 2009/41-003

The Benefits of the Exploration Initiatives

- provided a catalyst for an upsurge in company exploration to $223M in 2006-2007
- delineated potential targets for detailed exploration
- resulted in the commencement of several new mines
- PACE will spend an additional $31M from 2004 to 2011



SA Mineral Exploration Expenditure

The Current Mining Boom

Gawler Craton

Mines and emerging projects

- **Olympic Dam Mine** 1975
  Cu-Au-U
- **Challenger Mine** 1995
  Gold
- **Prominent Hill Mine** 2001
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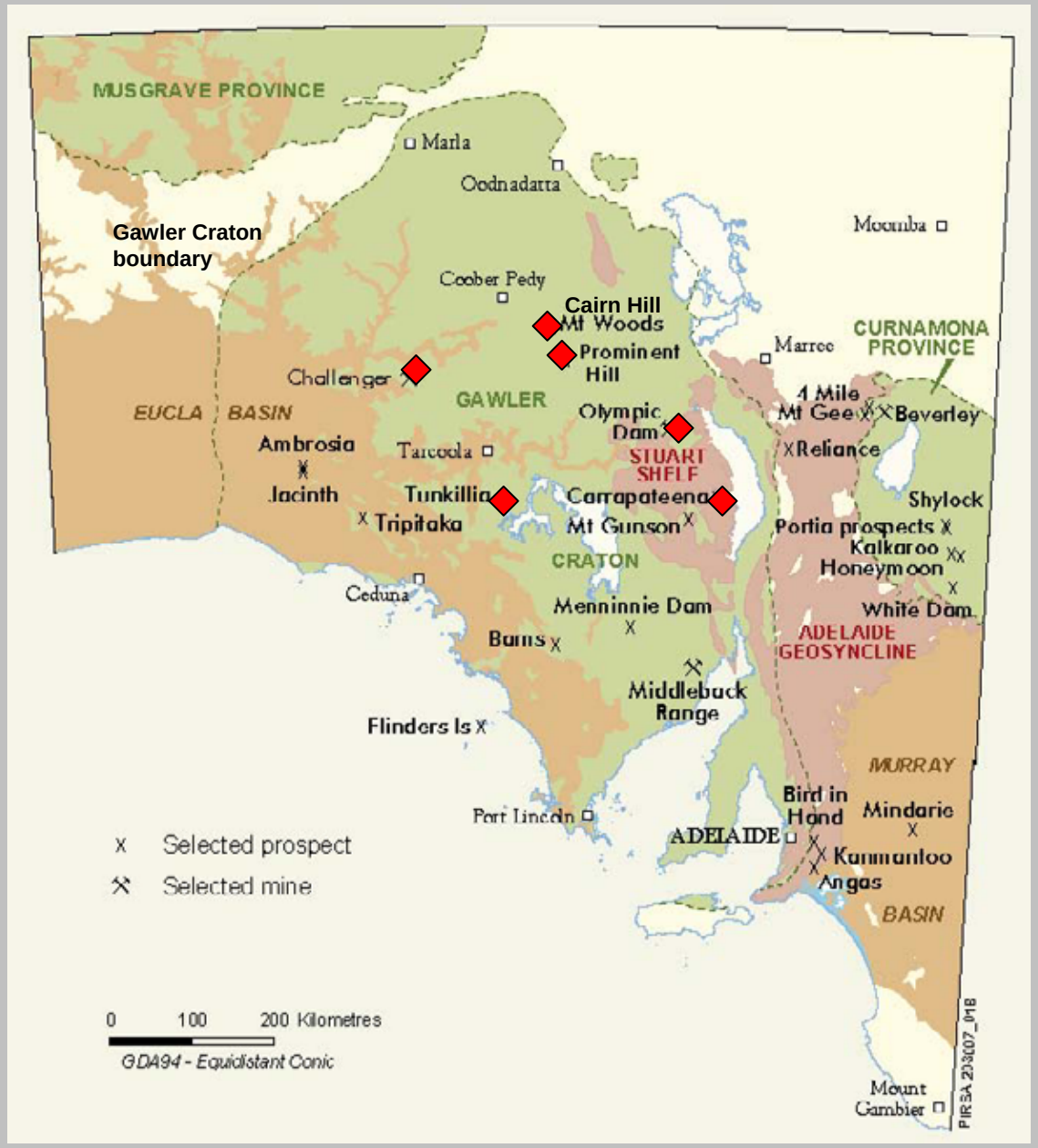
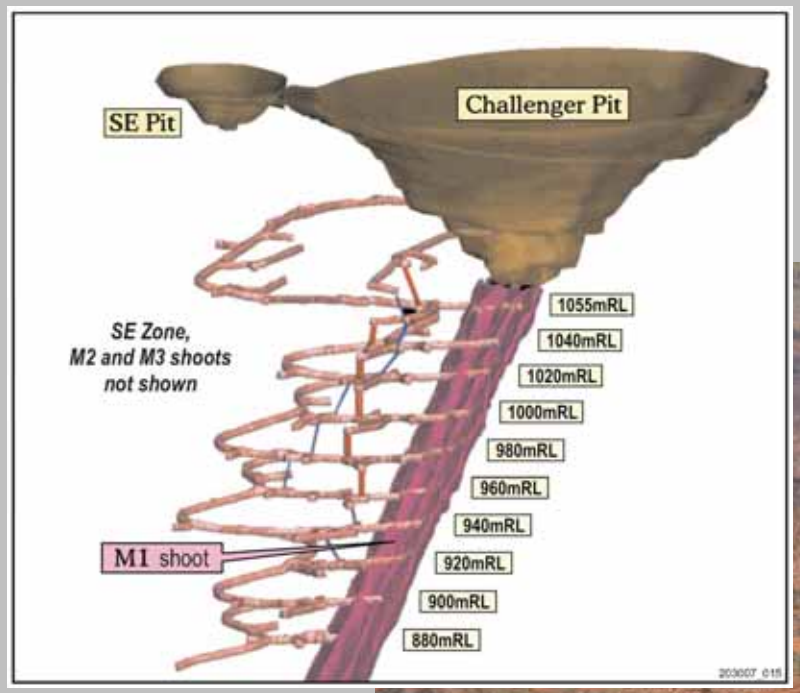
- **Carrapateena Prospect** 2005
  Cu-Au



Gawler Craton Mines and Emerging Projects

MINE	HISTORY	RESOURCE	ANNUAL PRODUCTION
Olympic Dam Mine	Discovered 1975 Mining commenced 1988	4.4 Bt @ 1.1% Cu 43 Mt Cu 1.4 Mt U 55 Moz Au	230,000 t Cu 4860 t U 3.3 t Au 500,000 t Cu after expansion
Challenger Mine	Discovered 1995 Mining commenced 2002	1.1M oz Au	110,000 oz Au
Prominent Hill Mine	Discovered 2001 Mining commenced in late 2006, prodn in 2008	120 Mt @ 1.3% Cu 1.5 Mt Cu 1.9 M oz Au	Approx 8 Mt/year 104,000t Cu 115,000 oz Au
Cairn Hill Deposit	Discovered 2005 Application for mining lease lodged	16 Mt @ 47% Fe 0.43 g/t Cu 0.17 g/t Au	1.35 Mt/a giving a mine life of 10 years
Tunkillia Deposit	Discovered 1995 Resource assessment continues	14 Mt @ 1.8 g/t Au 800,000 oz Au	
Carrapateena Prospect	Discovered 2005 905 m @ 2.1% Cu and 1 g/t Au in 2007 drill hole	One of the most spectacular drill hole intersections in Australian mining history	

Challenger Gold Mine – the first of the new generation discoveries



- discovered in 1995 using data from MESA's drilling and aeromagnetic programs
- commenced in 2002 – the first major gold mine in SA in 100 years

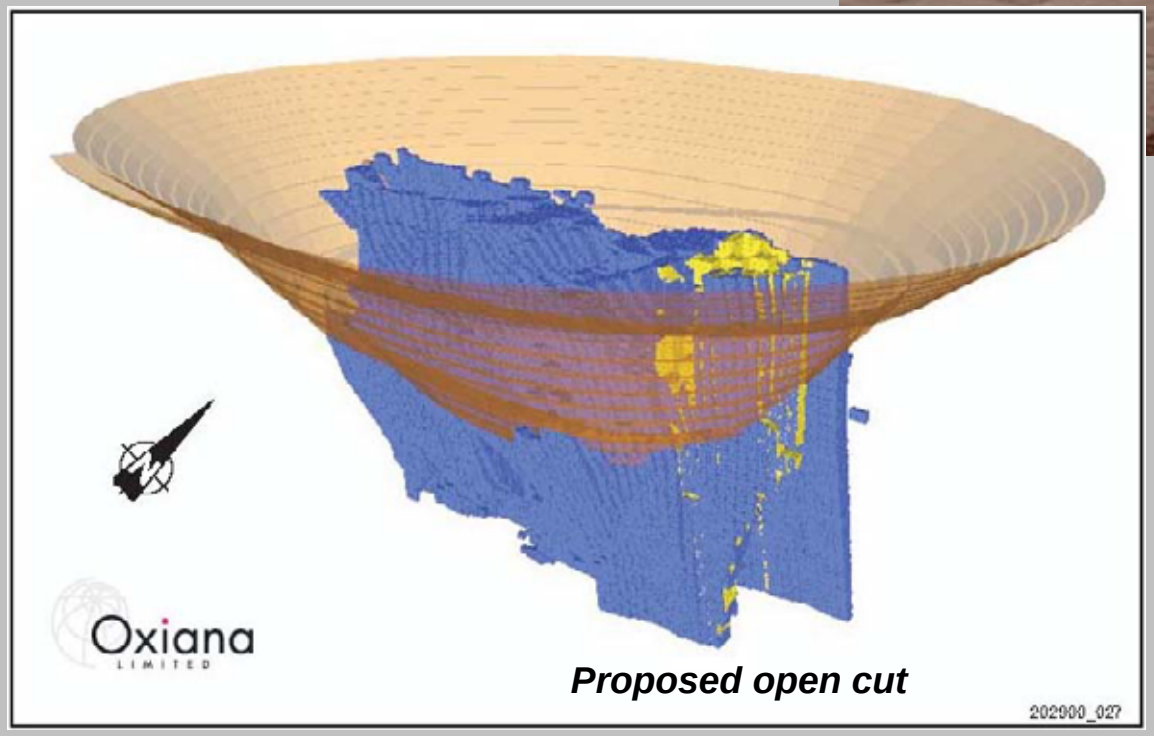
Resource
1.15 Mt @ 8.35 g/t Au
300,000 oz Au

Annual production
120,000 oz

Prominent Hill Mine

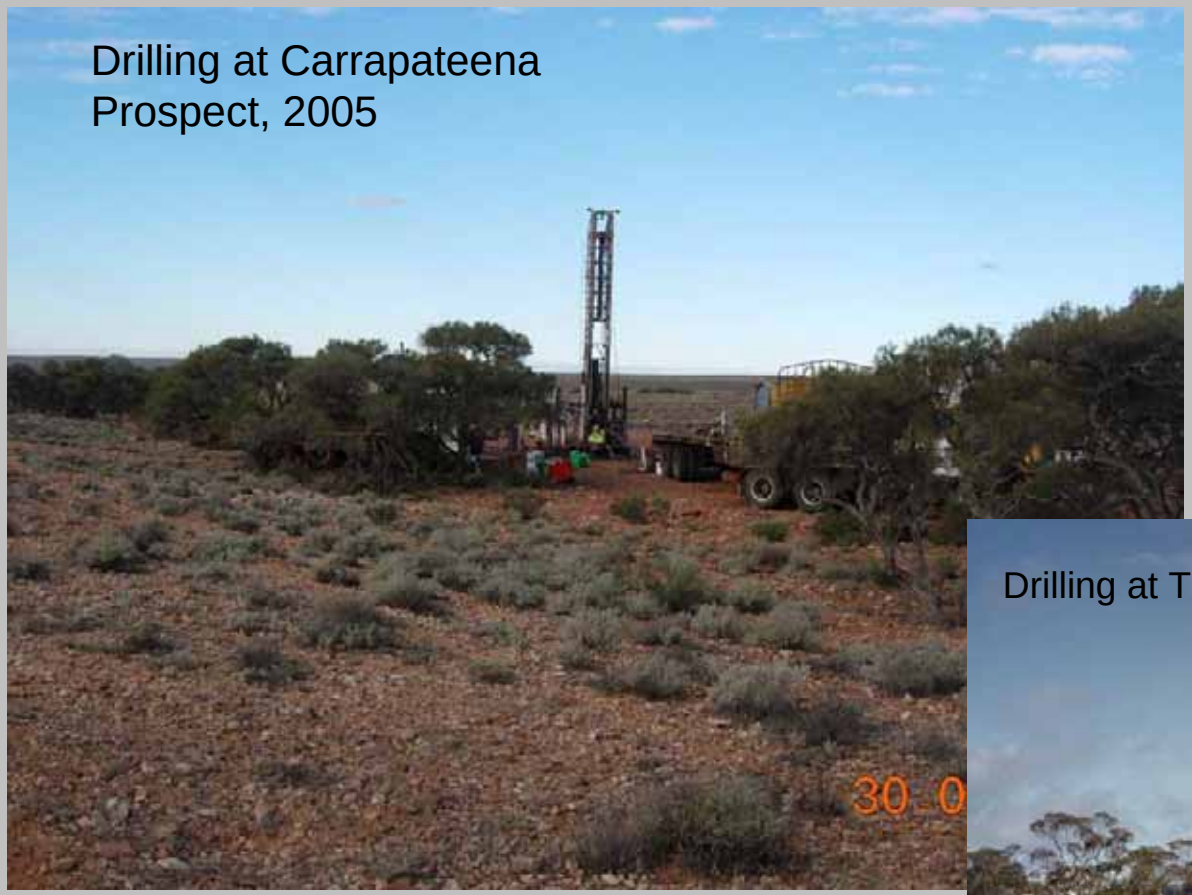
- discovered in 2001 during drilling of coincident geophysical anomalies below 100m of barren sediments
- first hole recorded the best Cu-Au intersection in SA in 25 years
- mining commenced in late 2006 and first production by late 2008
- resource is 120 Mt @ 1.3% Cu
- 1.5 Mt Cu and 1.8 Moz Au valued at $15B

Prominent Hill open cut, 2007



Proposed open cut

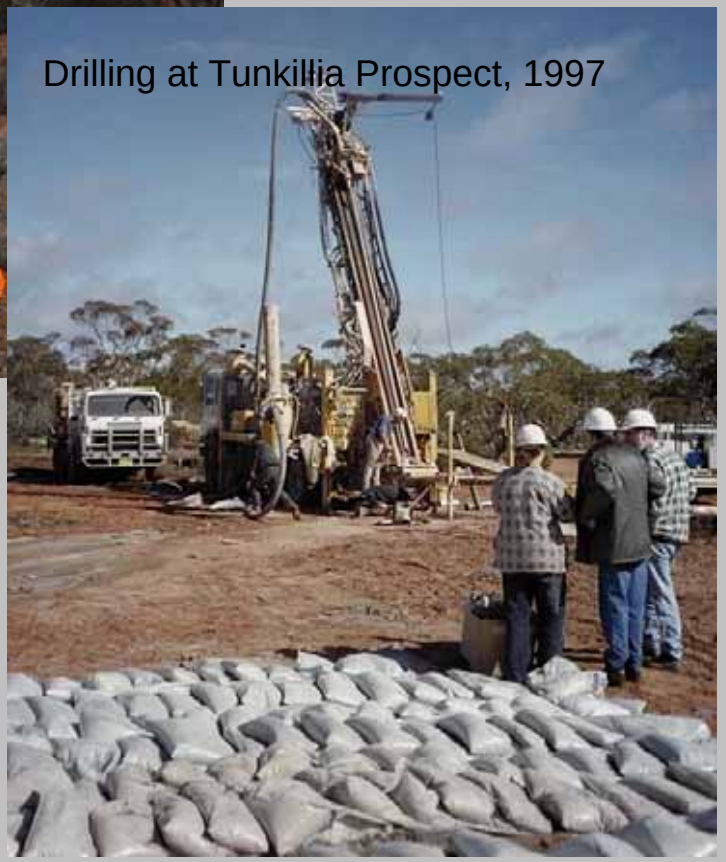
- total of $54M spent to date
- the mine will have a life of 10-40 years and employ up to 800



Drilling at Carrapateena Prospect, 2005

Tunkillia Deposit

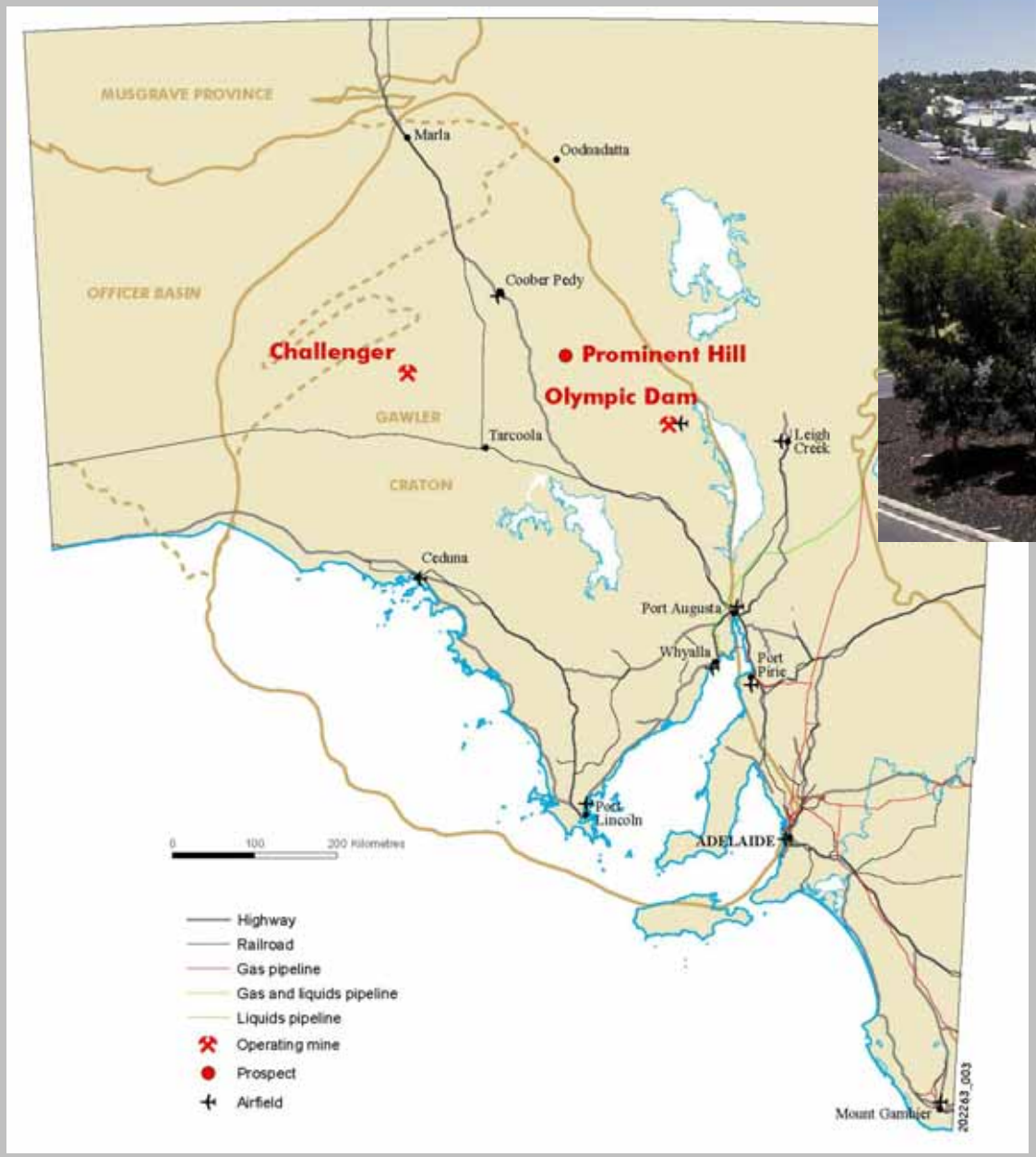
- discovered in 1995 after drilling a calcrete gold anomaly
- indicated resource of 800,000 oz Au
- resource assessment continues

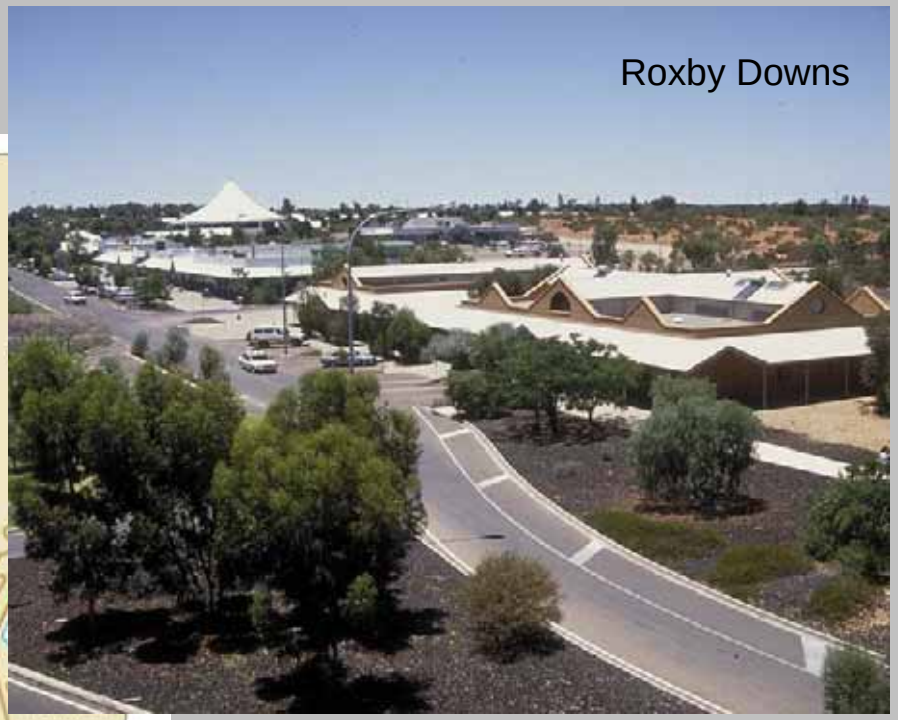


Drilling at Tunkillia Prospect, 1997

Carrapateena Prospect

- discovered in 2005 under 473 m of barren sediment
- 2007 drillhole recorded 905m @ 2.1% Cu and 1g/t Au
- $16M to be spent by 2008





Skills and Infrastructure Requirements

- attracting and training the workforce
- housing
- transport
- energy
- water
- telecommunications